THE GEOGRAPHICAL JOURNAL

VOLUME LXXV

JANUARY TO JUNE

1930

PUBLISHED UNDER THE AUTHORITY OF THE COUNCIL

EDITED BY THE SECRETARY

THE ROYAL GEOGRAPHICAL SOCIETY

KENSINGTON GORE LONDON S.W.7

EDWARD STANFORD LTD. 12 LONG ACRE W.C.2

AND 29 CHARING CROSS S.W.1

ROYAL GEOGRAPHICAL SOCIETY.

Patron.
HIS MAJESTY THE KING.

Vice-Patron.
H.R.H. THE PRINCE OF WALES, K.G., F.R.S.

Honorary President.
F.M. H.R.H. THE DUKE OF CONNAUGHT, K.G., G.C.B., G.C.S.I.

THE COUNCIL

(*Elected 24 June 1929 for the Session of 1929-30.*)

President : Colonel Sir Charles Close, K.B.E., C.B., C.M.G., F.R.S.

Vice-Presidents.

F.M. the Viscount Allenby, G.C.B., G.C.M.G.
Admiral Sir William Goodenough, K.C.B., M.V.O.
A. P. Maudslay, D.SC.
H. R. Mill, D.SC., LL.D.
Lieut.-Col. the Right Hon. Sir Matthew Nathan, G.C.M.G.
Lieut.-Col. Sir Francis Younghusband, K.C.S.I., K.C.I.E.

Treasurer—The Lord Biddulph.

Trustees—Douglas W. Freshfield, D.C.L. ; The Right Hon. the Marquess of Zetland, G.C.S.I., G.C.I.E.

Honorary Secretaries—Brigadier E. M. Jack, C.B., C.M.G., D.S.O. ; A. F. R. Wollaston, D.S.C.

Foreign Secretary—The Right Hon. Sir Maurice E. de Bunsen, Bart., G.C.M.G., G.C.V.O., C.B.

Members of Council.

L. C. Bernacchi, O.B.E.
Sir Harcourt Butler, G.C.I.E., G.C.S.I.
Maj.-Gen. Sir Percy Cox, G.C.M.G., G.C.I.E., K.C.S.I.
Colonel H. L. Crosthwait, C.I.E.
Rear-Admiral H. P. Douglas, C.B., C.M.G.
Prof. C. B. Fawcett, D.SC.
Prof. H. J. Fleure, D.SC.
Sir William Foster, C.I.E.
Maj.-Gen. Lord Edward Gleichen, K.C.V.O., C.B., C.M.G., D.S.O.
Air-Commodore F. V. Holt, C.M.G., D.S.O.
Lieut.-Col. C. K. Howard-Bury, D.S.O., M.P.
Prof. L. Rodwell Jones.
Admiral Sir Arthur Leveson, G.C.B.
Dr. T. G. Longstaff.
Colonel M. N. MacLeod, D.S.O., M.C.
The Rt. Hon. Sir Halford Mackinder.
Colonel R. Meinertzhagen, D.S.O.
Francis J. R. Rodd.
W. Lutley Sclater.
Rev. Walter Weston.
J. M. Wordie, M.A.

Secretary and Editor of Publications—Arthur R. Hinks, C.B.E., F.R.S.

Librarian.	*Map Curator.*	*Chief Clerk.*
Edward Heawood.	Edward A. Reeves.	C. R. Mobberley.

Bankers—Martin's Bank Ltd. (Cocks, Biddulph Branch), 43, Charing Cross, S.W.1.

General Fadon

CONTENTS

NO. 1 *JANUARY* 1930

HONDIUS'S PORTRAITS OF DRAKE AND CAVENDISH . 1

THE CENTRAL AFRICAN HIGHWAY. By OWEN TWEEDY . 2

A RECONNAISSANCE OF THE GREAT MAKARIKARI LAKE. By CAPT. THE HON. B. E. H. CLIFFORD, C.M.G., M.V.O. . . . 16

THE UNDERCUTTING OF CORAL REEF LIMESTONE ON THE COASTS OF SOME ISLANDS IN THE RED SEA. By W. A. MACFADYEN 27

HIMALAYAN RANGE NAMES 35

THE HIMALAYAN RANGES AND GODWIN AUSTEN'S MAP . . . 35

THE PROPOSED NOMENCLATURE OF THE KARAKORAM-HIMALAYA. By MAJOR KENNETH MASON, M.C., R.E. 38

HIMALAYAN NOMENCLATURE. By DR. T. G. LONGSTAFF . . 44

THE MISSING DRAFT PROJECT OF DRAKE'S VOYAGE OF 1577–80. By MISS E. G. R. TAYLOR 46

THE ZERZURA PROBLEM 48

MORE JOURNEYS IN SEARCH OF ZERZURA. By LIEUT.-COLONEL N. B. DE LANCEY FORTH 48

ZERZURA. By E. A. JOHNSON PASHA 59

THE LOST OASES. By W. J. HARDING KING 61

SEARCH FOR LOST OASES IN SOUTH LIBYAN DESERT: Review by W. J. HARDING KING 65

THE PROPOSED ARCTIC EXPEDITION IN THE *GRAF ZEPPELIN* 67

REVIEWS: Sussex. The Charm of Skye. The Cottages of England. Old Rhineland through an Englishman's Eyeglass. Eagles Black and White: The Fight for the Sea. The New Russia. The Structure of Asia. With Pen and Brush in Eastern Lands when I was young. Indien unter Britischer Herrschaft. Some Documents relating to the Rise of the Dutch Power in Ceylon, 1602–1670. Twenty Years among Primitive Papuans. The Races of Java. Four Faces of Siva. East for Pleasure. Olden Times in Zululand and Natal. My People the Sioux. The Road to Oregon. Clays. Climate. The World's Grasses. Sesquicentennial Celebration of Captain Cook's Discovery of Hawaii (1778–1928). Historia do Descobrimento e Conquista de India pelos Portugueses. The New World. Enigmas 71

THE MONTHLY RECORD: New Official Title and Divisions of Yugoslavia. Copenhagen and Baltic Trade. Geology and Minerals of Greece. The Mapping of Finland. Lop Nor Problem. Climatic Change in North Africa. Air Survey in S.E. Alaska. Dr. Troll's Explorations in the Andes 88

OBITUARY: Professor Naomasa Yamasaki. William Cecil Slingsby 93

CORRESPONDENCE: The Death of Mungo Park 95

MEETINGS: Session 1929–1930 96

MAPS:

Mr. Tweedy's Route across Central Africa from Rejaf to Gao . . 4

Sketch-map to illustrate Colonel de Lancey Forth's Journeys in the North Libyan Desert 50

The South Libyan Desert, from Egyptian and Sudan Surveys and from native information 66

Map of the Great Makarikari Lake . . . . . *following* 96

RIVER EXPLORATION IN LABRADOR BY CANOE AND DOG SLEDGE. By H. G. WATKINS 97

FORESTS AND PLANTS OF THE ANGLO-EGYPTIAN SUDAN. By DR. T. F. CHIPP 123

THE APPLICATION OF STEREOSCOPIC PHOTOGRAPHY TO MAPPING. By CAPTAIN M. HOTINE, R.E. 144

HIMALAYAN NOTES 166

THE NAMING OF MOUNT HOOD 173

THE VOYAGE OF THE *METEOR*: Review by D. J. M. . . . 174

REVIEWS: The Place-names of Sussex. A Detective in Kent. Hadrian's Wall. Travels in France during the Years 1787, 1788 and 1789. The Black Forest, its People, History and Traditions. Geographie der Schweiz. Jogging round Majorca. The Roman Campagna and its Treasures. Stones, Hilltops and the Sea. Hellas Revisited. Asia: An Economic and Regional Geography. Crusader's Coast. Trailing the Giant Panda. The Assyrians and their Neighbours. Four Months' Camping in the Himalayas. Delhi: Its Story and Buildings. Beginnings of Vijayanagar History. Romantic Ceylon. China. Egypt in Silhouette. The Fortunate Islands. Australian Discovery. Birds and Green Places. On the Stream of Travel. Ferdinand Magellan. De Eerste Schipvaart der Nederlanders naar Oostindië onder Cornelis de Houtman, 1595–1597. The Voyages of the Cabots and the English Discovery of North America under Henry VII and Henry VIII. The most Noble and Famous Travels of Marco Polo, together with the Travels of Nicolo de' Conti. The Life and Voyages of Captain Cook. An Historical Geography of Europe, 800–1789. A New Regional Geography of the World. Sail. Climbs and Ski Runs. Carte Internationale du Monde au 1,000,000° 177

THE MONTHLY RECORD: The Nauen Time Signals. Catalogue of Surrey Maps. Vegetation of the Southern Pennines. Flow of Water through the Straits of Dover. Towns of Lower Saxony. Hoar-Frost and Glacier-Growth in Norway. San'a, Capital of Yemen. The Everglade Keys of Florida. Climate and Flora of Patagonia. Circulation of the Indian Ocean. Greenland's former Climate. Marl Formation in Lakes. Bibliographie Geographique, 1928 . 200

MEETINGS: Session 1929–1930 208

MAPS:

To illustrate Dr. Chipp's paper:
Sketch-map of Vegetation Belts of West African Botanical Region . 126
Mean Annual Rainfall of the Sudan, 1905–1909 128
Sketch-map of Vegetation Belts of Anglo-Egyptian Sudan . . 130
River exploration in Labrador from surveys by H. G. Watkins, J. M. Scott, and L. A. D. Leslie, 1928–29 . . . . . *following* 208

COLONEL SIR THOMAS HUNGERFORD HOLDICH, K.C.M.G., K.C.I.E., C.B. 209

A JOURNEY THROUGH THE NORTH-WEST OF CENTRAL AUSTRALIA IN 1928. By MICHAEL TERRY 218

THE ICE-AGE ON THE TIBETAN PLATEAU AND IN THE ADJACENT REGIONS. By DR. EMIL TRINKLER . . . 225

THE OETZTHAL GLACIERS IN HISTORY AND CARTOGRAPHY BEFORE 1800. By J. MONROE THORINGTON . . 233

BURST OF A GLACIAL DAM IN ICELAND. By J. H. R. . 241

REPORT ON A VISIT TO THE ROSS DEPENDENCY. By DR. E. H. MARSHALL, D.S.O. 244

THE ANTARCTIC 252

ROAD MAKING IN THE TROPICS 261

THE EARLY FALSIFICATION OF WEST INDIAN LATITUDES: Review by J. A. WILLIAMSON 263

REVIEWS: Great Britain. The Medway River and Valley. Haunting Edinburgh. Un Pays de Haute Montagne: L'Oisans. L'Oisans du Moyen-Age. Atlantis in Andalucia. Spain. In Search of Slovakia. The Hittite Empire. The Economic Development of India. The Last Home of Mystery. The Field-book of a Jungle-Wallah. The Golden Land. A History of American Life. The Handbook of the British West Indies, British Guiana and British Honduras, 1929–30. The Discoverer. Spanish Documents concerning English Voyages to the Caribbean, 1527–1568. Malabar and the Portuguese. Itineraria Romana. La Frontière. Grenzen. Die Grossmächte vor und nach dem Weltkriege. A Text Book of Tropical Agriculture. Alfred Weber's Theory of the Location of Industries. Coastwise Cruising 266

THE MONTHLY RECORD: Dr. Chipp's Lecture on Forests and Plants of Anglo-Egyptian Sudan. Vasco-Cantabrian Highlands. Northern Finland. Russian Research in Novaya Zemlya. Mr. Rock's Explorations on the Upper Hwang Ho. The Gulf of Maine Fishing Grounds. An Early Map by George Washington. Reliability of Surveys in Hispanic America. The Ross Dependency 282

MEETINGS: Session 1929–30 288

MAPS:

Mr. Terry's route across Central Australia in 1928 220
Sketch-map showing Hagavatn and its glacial dam, Iceland . . . 243
Sketch-map to illustrate Dr. Marshall's account of whaling in the Ross Sea, 1928–1929 245
Sketch-map to illustrate work of expeditions in Antarctic . . . 254

MAJOR JAMES RENNELL. By SIR RENNELL RODD . . . 289

BOUNDARY WORK IN THE BALKANS. By COLONEL FRANK L. GILES, D.S.O., O.B.E., late R.E. 300

THE CLIMATIC CONDITIONS OF THE TARIM BASIN. By LIEUT.-COLONEL REGINALD C. F. SCHOMBERG, D.S.O. . . . 313

FURTHER NOTES ON THE SHORE TOPOGRAPHY OF THE ENGLISH LAKES. By THOMAS HAY 324

THE MOUNTAINS ABOUT TATSIENLU 345

SKETCHES OF THE TATSIENLU PEAKS. By HERBERT STEVENS 353

CANADIAN GEOGRAPHICAL SOCIETY 356

BIOGRAPHY OF CAPTAIN SCOTT: Review by F. D. . . . 357

LANDFORMS OF CENTRAL AND SOUTHERN FRANCE: Review by A. G. O. 359

REVIEWS: The Physiographical Evolution of Britain. Albania. Sulle Orme di Marco Polo. Im Land der Stürme. Landmarks of the Deccan. The Muhammadan Emirates of Nigeria. Gazetteer of Ilorin Province. From Coast to Coast by Motor. Twenty-five Years in South America. Founders and Pioneers of South Australia. The Economics of Australian Coal. La Mer du Groenland. Scientific Results of the Norwegian Antarctic Expeditions, 1927–1928 and 1928–1929. Earth Flexures. La Nouvelle Cythère (Tahiti). Livingstone. The Pitcairn Island Register Book. Round the World on a Cycle. The Growth of the World and its Inhabitants. Great Navigators and Discoverers. Hakluyt's Voyages. A Geographical Grammar. Mast and Sail in Europe and Asia . . 364

THE MONTHLY RECORD: Third General Index. Changes in the Course of the Trent. Forests of the Karst. Further Explorations by Dr. and Mrs. Visser. A Saharan Meteorological Record. Railway for South-West Tanganyika Territory 376

OBITUARY: Dr. Charles Hose, D.SC. 380

CORRESPONDENCE: The African Bulge. Zerzura . . . 381

MEETINGS: Session 1929–1930 384

MAPS:

Sketch-map to illustrate Colonel Giles' paper 302
The Boundaries of Albania 306
Sketch-map to illustrate Col. Schomberg's paper on the Tarim Basin . 314
Sketch-maps of Glenridding, Church Beck and Yewdale Beck deltas . 342, 343
Sketch-map showing positions from which Mr. Stevens' sketches were made 354
The Shore Topography of the English Lakes . . . *following* 384
Mr. Stevens' sketches of the Tatsienlu Peaks . . . *following* 384

THE ITALIAN EXPEDITION TO THE KARAKORAM in 1929. By H.R.H. THE PRINCE AIMONE OF SAVOIA-AOSTA, DUKE OF SPOLETO 385

GEOLOGICAL WORK OF THE ITALIAN EXPEDITION TO THE KARAKORAM. By PROFESSOR ARDITO DESIO . . . 402

THE SEINGHKU AND DELEI VALLEYS, NORTH-EAST FRONTIER OF INDIA. By F. KINGDON WARD . . . 412

EXPLORATIONS IN BAFFIN ISLAND. By J. DEWEY SOPER . 435

HYDRO-ELECTRIC POWER DEVELOPMENT IN NEW ZEALAND. By R. OGILVIE BUCHANAN 444

AN INTRODUCTION TO GEOTECTONICS : Review by J. W. G. 462

REVIEWS : Days in Lakeland. Derbyshire. Medieval Cheshire. Turkey and Syria Reborn. Alai ! Alai ! China. Der Hwang-Ho. A History of the Far East in Modern Times. Foreign Colonial Administration in the Far East. Ju-Ju and Justice in Nigeria. Kenya Mountain. Kenya. Out of the Crucible. Canada West. Recherches sur le Commerce génois dans la Mer Noire au XIII[e] Siècle. Emigration from the British Isles. Répertoire des Métaphores et Mots français tirés des Noms de Villes et de Pays étrangers. Superstitions of Sailors 466

THE MONTHLY RECORD : Medals and Awards, 1930. A Botanical Expedition in Persia. Reindeer for Northern Canada. New American Oceanographic Institution. The Yellowstone Canyon, Wyoming. Distribution of Woodland and Scrub in Southern Chile. The Empire and Agriculture. Importance of Weather Cycles in Hydrology 475

MEETINGS : Session 1929–1930 480

MAPS :

Preliminary sketch-map of routes of the Duke of Spoleto's Italian Expedition to the Karakoram 388
Sketch-map of Mr. Kingdon Ward's route on the Assam–Burma Border 414
And in the Mishmi Hills 416
Sketch-map of Mr. Soper's route across Southern Baffin Island . . 436
Sketch-maps showing
Potential Power Sites in New Zealand 445
Distribution of Average Annual Rainfall 447
Government Hydro-electric Power Scheme and Developed Power of chief stations to 31 Dec. 1929 452

CAMBRIDGE EAST GREENLAND EXPEDITION, 1929: ASCENT OF PETERMANN PEAK. By J. M. WORDIE . . 481

Appendices: Survey, R. C. Wakefield, 493; Geology, W. F. Whittard, 495; Meteorology, G. Manley, 498

EXPLORATIONS IN THE EASTERN KARAKORAM AND IN THE WESTERN KUNLUN. By DR. EMIL TRINKLER . 505

NORTH-WESTERN MANCHURIA AND THE REINDEER-TUNGUS. By MISS E. J. LINDGREN 518

SAMUEL PURCHAS. By DR. E. G. R. TAYLOR 536

BRITISH POLAR EXHIBITION, 1930 539

ENCYCLOPAEDIA OF GEOGRAPHY: Review by O. H. T. R. . 540

REVIEWS: South Wales. The Place-Names of Sussex. Isles of the Aegean. Treasure of Ophir. Asie Occidentale. The former Glaciation of the East Lidar Valley, Kashmir. Spedizione Italiana de Filippi nell' Himàlaia, Caracorùm e Turchestàn Cinese (1913–1914). Where Lion Reign. From an old Cape Homestead. Man-Hunting in the Jungle. Das Standortsproblem in der Landwirtschaftsgeographie (das Neuland Ostaustralien). The Problem of Krakatao as seen by a Botanist. Life in the Pacific Fifty Years ago. Skrifter om Svalbard og Ishavet. Exploring about the North Pole of the Winds. Early Science in Oxford. History of French Colonial Policy. A Briefe Historie of Moscovia. Commentaries of Ruy Freyre de Andrada. Fondamenti di Geografia Politica 544

THE MONTHLY RECORD: Death of Dr. Nansen. Presentation of Cullum Geographical Medal for 1929 to Dr. H. R. Mill. The Beginnings of the British Empire. Chemical Denudation in Sweden. Changes in the Rhone Delta. Summer Currents in Bab-el-Mandeb. Californian Coastal Fogs. The Great Bahamas Bank. Rock-Weathering in Australia. Dutch Oceanographical Expedition. Waterproof Maps for Use in the Field. Correction of Review . 560

OBITUARY: George Goudie Chisholm, M.A., LL.D. T. Alexander Barns 567

MEETINGS: Session 1929–1930 568

MAPS:

Sketch-map of Dr. Trinkler's route 506
Sketch-map showing probable route of the Schlagintweits . . . 514
Sketch-map of Miss Lindgren's route through Barga, North-Western Manchuria 520
Ethnographical sketch-map of the Argun basin 522
The coast region of East Greenland between Scoresby Sound and Danmark Havn . . . . . *following* 568

930

481

505

518

536

539

540

544

560

567

568

506

514

520

522

568

PERIODICAL ROOM
MEDICAL LIBRARY
JAN 22 1930

THE GEOGRAPHICAL JOURNAL

Vol LXXV No 1 January 1930

Hondius's Portraits of Drake and Cavendish 1
The Central African Highway . . . . . Owen Tweedy 2
A Reconnaissance of the Great Makarikari Lake
Capt. the Hon. B. E. H. Clifford 16
The Undercutting of Coral Reef Limestone on the Coasts of some Islands in the Red Sea . . . . . W. A. Macfadyen 27
Himalayan Range Names: 35
The Himalayan Ranges and Godwin Austen's Map: Letters from Sir Sidney Burrard; The Proposed Nomenclature of the Karakoram Himalaya: Major Kenneth Mason; Himalayan Nomenclature: Dr. T. G. Longstaff
The Missing Draft Project of Drake's Voyage of 1577-80
Miss E. G. R. Taylor 46
The Zerzura Problem: 48
More Journeys in search of Zerzura: Lt.-Col. N. B. de Lancey Forth; Zerzura: E. A. Johnson Pasha; The Lost Oases: W. J. Harding King
The Proposed Arctic Expedition in the *Graf Zeppelin* . Dr. Fridtjof Nansen 67
Reviews · The Monthly Record Obituary Correspondence
Meetings: Session 1929–1930
Society Notices iii
Contents v

THE ROYAL GEOGRAPHICAL SOCIETY
KENSINGTON GORE LONDON S.W.7
EDWARD STANFORD LTD. 12 LONG ACRE W.C.2
AND 29 CHARING CROSS S.W.1
PRICE TWO SHILLINGS

THE GEOGRAPHICAL JOURNAL is published monthly by the Royal Geographical Society. It contains the papers read at the Meetings of the Society, with the discussions: illustrated with original photographs, and with maps drawn from the authors' surveys by the draughtsmen of the Society. It contains also Articles on geographical topics; Reviews of important books and maps; a Monthly Record of Geographical work; and occasional Letters from Correspondents.

The *Journal* is sent free each month to all Fellows of the Society, and is sold to the public at Two Shillings per number through Messrs. Edward Stanford Ltd. of 12 Long Acre W.C.2 and 29 Charing Cross S.W.1; Messrs. George Philip and Son Ltd. of 32 Fleet St. E.C.4; Messrs. Sifton, Praed and Co. Ltd. of 67 Saint James St. S.W.1; and the International News Company, New York City, U.S.A. It may also be ordered direct from the Office of the Society at Twenty-seven Shillings per year, post free. It is registered for transmission to Canada by Canadian Magazine Post.

CONTENTS

HONDIUS'S PORTRAITS OF DRAKE AND CAVENDISH 1

THE CENTRAL AFRICAN HIGHWAY. By Owen Tweedy . 2

A RECONNAISSANCE OF THE GREAT MAKARIKARI LAKE. By Capt. the Hon. B. E. H. Clifford, C.M.G., M.V.O. 16

THE UNDERCUTTING OF CORAL REEF LIMESTONE ON THE COASTS OF SOME ISLANDS IN THE RED SEA. By W. A. Macfadyen 27

HIMALAYAN RANGE NAMES 35
- The Himalayan Ranges and Godwin Austen's Map . . 35
- The Proposed Nomenclature of the Karakoram-Himalaya. By Major Kenneth Mason, M.C., R.E. 38
- Himalayan Nomenclature. By Dr. T. G. Longstaff . . 44

THE MISSING DRAFT PROJECT OF DRAKE'S VOYAGE OF 1577–80. By Miss E. G. R. Taylor 46

THE ZERZURA PROBLEM 48
- More Journeys in Search of Zerzura. By Lieut.-Colonel N. B. de Lancey Forth 48
- Zerzura. By E. A. Johnson Pasha 59
- The Lost Oases. By W. J. Harding King 61
- Search for Lost Oases in South Libyan Desert: Review by W. J. Harding King 65

THE PROPOSED ARCTIC EXPEDITION IN THE *GRAF ZEPPELIN* 67

REVIEWS: Sussex. The Charm of Skye. The Cottages of England. Old Rhineland through an Englishman's Eyeglass. Eagles Black and White: The Fight for the Sea. The New Russia. The Structure of Asia. With Pen and Brush in Eastern Lands when I was young. Indien unter Britischer Herrschaft. Some Documents relating to the Rise of the Dutch Power in Ceylon, 1602–1670. Twenty Years among Primitive Papuans. The Races of Java. Four Faces of Siva. East for Pleasure. Olden Times in Zululand and Natal. My People the Sioux. The Road to Oregon. Clays. Climate. The World's Grasses. Sesquicentennial Celebration of Captain Cook's Discovery of Hawaii (1778–1928). Historia do Descobrimento e Conquista da India Pelos Portugueses. The New World. Enigmas 71

THE MONTHLY RECORD: New Official Title and Divisions of Yugoslavia. Copenhagen and Baltic Trade. Geology and Minerals of Greece. The Mapping of Finland. Lop Nor Problem. Climatic Change in North Africa. Air Survey in S.E. Alaska. Dr. Troll's Explorations in the Andes 88

OBITUARY: Professor Naomasa Yamasaki. William Cecil Slingsby 93

CORRESPONDENCE: The Death of Mungo Park. M. Cameron Blair 95

MEETINGS: Session 1929–1930 96

MAPS: Mr. Tweedy's Route across Central Africa from Rejaf to Gao 4
Sketch-map to illustrate Colonel de Lancey Forth's Journeys in the North Libyan Desert 50
The South Libyan Desert, from Egyptian and Sudan Surveys and from native information 66
Map of the Great Makarikari Lake . . . . . *following* 96

CASELLA

SURVEYING INSTRUMENTS

Catalogue and particulars post free on request

C. F. CASELLA & CO. LTD.

REGENT HOUSE, FITZROY SQUARE, LONDON, W.1

(Please note New Address)

A Great Work with a Great Object

THE

SHAFTESBURY HOMES AND 'ARETHUSA' TRAINING SHIP

Over 28,000 poor boys and girls have been given a chance in life, and have been trained to become good and useful sons and daughters of the Empire.

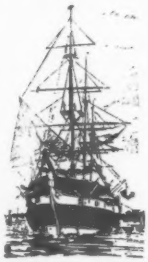
10,000 boys have been sent to the Royal Navy and Mercantile Marine.

1,100 Children are always being maintained.

FUNDS URGENTLY NEEDED

to prevent curtailment of any Branch of the Society's Work.

Training Ship 'Arethusa'



Patrons: Their Majesties the KING and QUEEN, H.R.H PRINCESS MARY, Countess of HAREWOOD, Field-Marshal H.R.H. THE DUKE OF CONNAUGHT. *President:* H.R.H. THE PRINCE OF WALES, K.G. *Chairman and Treasurer:* FRANCIS H. CLAYTON, Esq. *Deputy Chairman:* LORD DARYNGTON. *Chairman of 'Arethusa' Committee:* HOWSON F. DEVITT, Esq. *Secretary:* F. BRIAN PELLY, A.F.C.

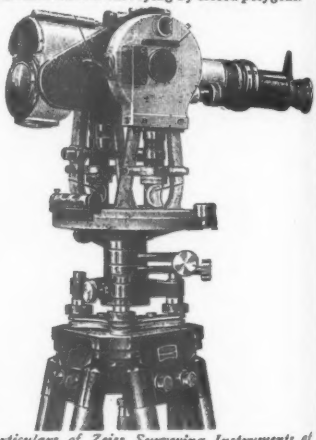
164, Shaftesbury Avenue, London, W.C.2

The Society pleads for Legacies and Bequests.

ZEISS

REDUCING TACHEOMETER

for exact optical measurement of distances by the polar method and for surveying by closed polygons.



Full particulars of Zeiss Surveying Instruments of every description in Illustrated Catalogue "G 114," on request, from the British Representatives:

CARL ZEISS (LONDON) LTD.

CARL ZEISS JENA **Winsley House, Wells Street, Oxford Street, London, W.1.** CARL ZEISS JENA

UNIV. OF MICH.

Hęc illa est candide inspector, illustrissimi Thomæ Candyssh nobilis Angli ad vnguem, imago; qui ex Anglia 21 Iulij 1586 nauem conscendens, totum terræ ambitum circumnauigauit, rediitq, in patrię portu Plimouth 19 Septemb. 1588. Iodocus Hondius sculp. Lond.

Effigies fortiss: Ducis Francisci Draci ad viuum, una cu delitescentione admiranda ipsius nauigationis, qua 13. Decemb. 1577 ex Anglia incepit. 4° vero Kalen. Octob. 1580. feliciss. absoluit.

The
GEOGRAPHICAL JOURNAL

Vol LXXV No 1 R.G.S. *January 1930*

HONDIUS'S PORTRAITS OF DRAKE AND CAVENDISH

A PAIR of early engraved portraits of the first two English circumnavigators has long been known from copies in the British Museum, one pair being inserted in the "broadside" at the foot of the Museum copy of Hondius's map of their route; and from this fact they have been also ascribed to Hondius, though actually unsigned. They were reproduced by Sir Sidney Colvin on p. 45 of his large volume on 'Early Engraving and Engravers in England,' published by the British Museum in 1905, and no earlier version of the engravings appears to have been generally known.

We are now able to give facsimiles of the original engravings of these portraits, signed by Hondius, from which, it seems evident, the British Museum specimens must have been copied. Through the gift of Mr. W. A. Cadbury the Society lately became possessed of a volume of maps, put together by William Burton (brother of the author of the 'Anatomy') probably about 1600, which includes the rare map by Hondius (the second copy acquired by the Society within the past few years), and, pasted on the back of it, the portraits now reproduced. They differ in several ways from the later copies. As commonly happens with copies, the later versions are reversed, Drake facing right, and Cavendish left. Then, besides giving Hondius's name, the originals state that he made them in London (which he left before November 1593), thus putting back by a year or two at least the date sometimes assigned both to them and to the map. That of Drake closely resembles the engravings by De Leu and De la Houve, reproduced by Mrs. Nuttall and Mr. Wagner respectively, and the common source of all seems to have been a painting by Rabel, which De Leu avowedly followed. A further difference between the original engraving and the copy is the correct representation in the former of Drake's track on the coast of North-Western America, left out of the copy, as were also Drake's arms from the shield provided for the purpose.*

The discovery of these original engravings raises once more the question whether the "broadside" was printed to accompany the first issue of the map or was a later addition.

*Since arranging for the present reproductions we have been informed by Mrs. Nuttall that a print of the original engraving of the Drake portrait was found by her a few years ago in Berlin.

THE CENTRAL AFRICAN HIGHWAY: *A paper read at the Evening Meeting of the Society on 2 December 1929, by*

OWEN TWEEDY

THE story of the journey which Captain Crofton and I made last spring, along what I have called the Great Central African Highway, calls for a short introduction. We were in no sense a Mission, though as such we were invariably dubbed in the French or Belgian Colonies. We were hardly an expedition: for expeditions are formidable affairs which cost any amount of money, and call for vast preparations ahead. We were a party travelling from one place to another with a route, but nothing else, planned ahead. Captain Crofton had been big-game shooting in South Sudan. I had been trailing the Nile and on through Uganda and Kenya to Zanzibar. Captain Crofton had had a car on his shooting trip. We both had to get home, and we chose to go home by the car. Our route was to be from Nile to Niger and thence across the Sahara to Algiers: and we got home—not too much the worse for wear. The Sahara, as we tackled it, is not to be recommended. It is too exciting, and our car was not used to excitement. But from Nile to Niger it is possible, as a private and unorganized unit, to travel as we did—in one small car, depending on the countries through which we passed for the essentials of such travel—food, water, petrol and oil.

On my arrival at Rejaf, in the first week of last March, I saw for the first time the car in which I was about to embark on 5500 unknown miles to Algiers. It was a 10-cwt. 22-horse-power Chevrolet. We had ordered a Kenya body—half tourer, half lorry, and most comfortable. The company delivered a grocer's delivery van body, made for cheapness and upholstered for economy. The grocer's van never let us down for mechanical causes; it brought us back to London, and its heart still beats strong in Scotland as a shooting lorry.

We left Rejaf, by mistake, on the 13th of the month. Neither Captain Crofton nor Muhammad, our Swahili ex-elephant poacher cook, realized the date. I suffered agonies of superstitious terror which I had to keep to myself. For the first 100 miles crossing the Nile–Congo divide the road was fair, though in places badly corrugated; and as we were, of course, scandalously overloaded, we felt every bump. We spent our first night at Yei, the centre of the Anti-Sleeping Sickness Mission in Mongalla Province of the Sudan. The campaign has been in force since the Belgians evacuated the Lado Enclave on King Leopold's death, and has made such remarkable progress that to-day the terrible disease has almost ceased to exist. But this result has only been attained in the face of intense native suspicion. Sleeping sickness, though undiagnosed, had been in Central Africa for centuries. The Arab slave-traders had learned from experience that a slave with a swelling on his neck always died quickly, and had laid down a routine for the inspection of slave droves from the interior. Those with swellings in their necks were discarded as useless for the markets of Omdurman, Cairo, Constantinople, and Jidda. The Mission began with a similar routine of inspection, and the natives, very naturally, jumped to the conclusion that

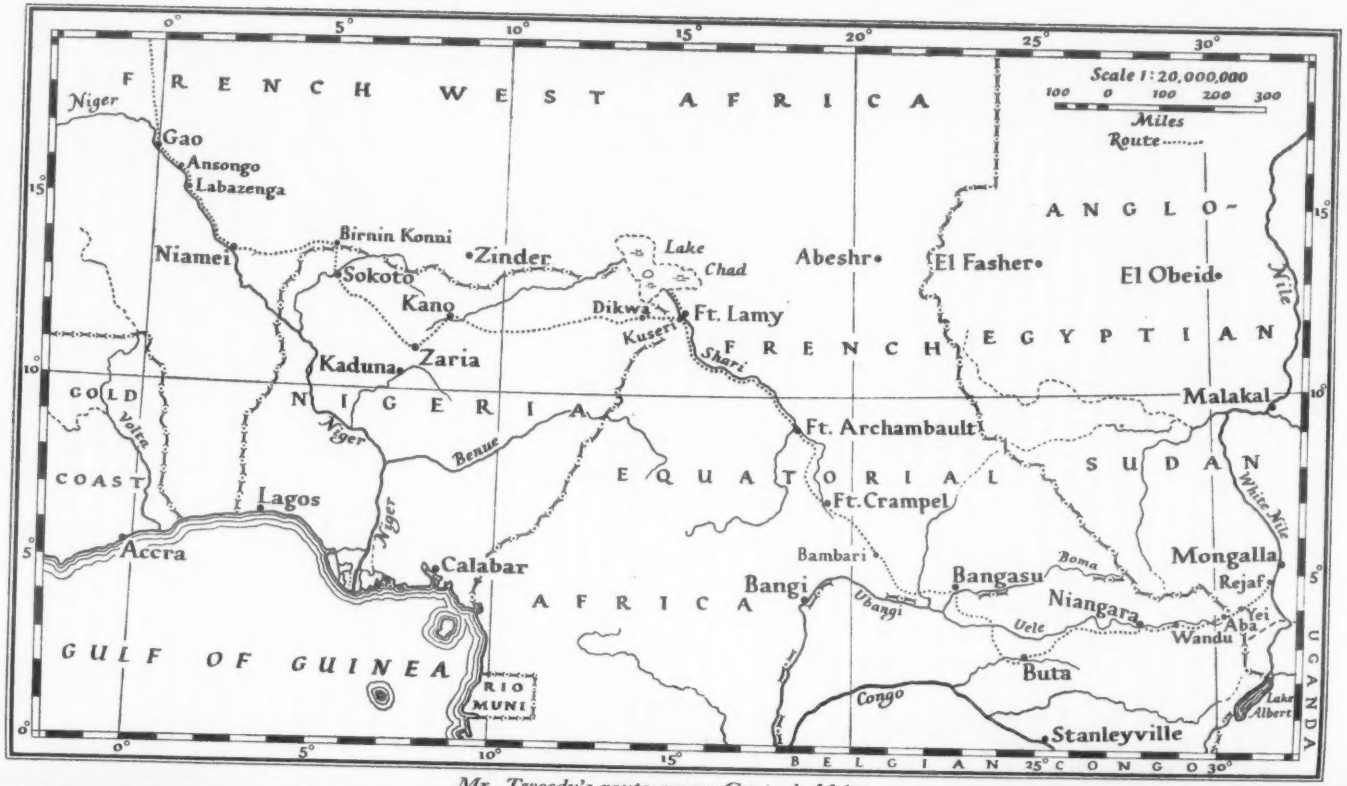
these white doctors were only a fresh variety of slave traders; while the infected in the segregation camps had one wish, and one wish only, to escape. The result was that they had to be guarded as prisoners rather than as patients. Again, native mentality responds only to quick and visible results. The cure of sleeping sickness is slow and undramatic, and the Mission's success would have been long in coming had it not been for the discovery of Salvarsan. In Mongalla, as elsewhere in those parts of Africa, syphilis is very generally spread. Suddenly, the white doctor produced a wonder-working elixir, and the native with his own eyes saw the healing in a month or two of an obstinate sore which had defied the skill of his witch-doctors for years. Salvarsan made medical and, through medicine, administrative history in the Southern Sudan.

The Nile–Congo divide is highland scrub country, and to us it recalled the devastated areas in France. On either side of the road the high grass was rank and discoloured. The thin, ragged thorn trees were flat-topped and looked as though they had suffered some violence from outside agencies. Huge red ant-hills, some as high as 12 feet, looked like the wreckage of shell-shattered farm-houses. Only the hills were African, looking with their glassy smooth domes just like greasy purple blancmanges.

Past the Sudan–Belgian–Congo frontier at Aba we found the *Route Royale* which the Belgians built during the occupation of the Lado Enclave, from the Nile to the Congo. It is 700 miles long, beautifully graded, well drained, and has a hard red marl surface which, even in the rains, resists traffic remarkably well. All along the 500 miles from Aba to Buta it was marked with kilometre posts, and at every twentieth post there was a standing camp, numbered according to its position. These camps are called *Cases des Cantonniers*, and they are the backbone of the Belgian service for the maintenance of the road. A Belgian Public Works official makes periodic tours of the whole length, and where he finds the surface damaged or the drains blocked, he orders the local native authority responsible for the upkeep of that particular stage to mobilize the necessary quota of men in the nearest *Case des Cantonniers*. They remain there as a working unit, under police guard, until the damage has been made good. We met at least a dozen such gangs, working under a trained native road engineer. Their methods were most up to date. The camber levels were properly staked out; the drains were dug along tape measures; and we saw two steam rollers. We gathered that this road labour was excused taxation and received a small daily wage in addition.

Our first stop in the Congo was at Wandu, where the Belgian Government has established a farm for the training of the African elephant for domestic purposes. It is an experiment—the first of its kind in Africa—and its routine is that of India and Burma.

We camped that night outside one of the Government rest-houses which are scattered all along the length of the *Route Royale*. I mention this camp because it was the first we sampled. But not only in the Congo, but all along our 3500-mile route from Rejaf to Gao on the Niger, there were these periodic rest-houses. They were not luxurious; we never slept inside one; but they were shelters on the road where Muhammad never, even in apparently unpopulated wastes, failed to be able to recruit labour—men to fetch water and to hew wood; and women to sell and pluck as many skinny hens as we could eat.



Mr. Tweedy's route across Central Africa

Mr. Tweedy's route across Central Africa

The "Route Royale" passing into tropics of Ituri Forest from scrublands of Nile–Congo divide

Bridge nearing completion over Bahr Ili, French Equatoria (from south)

Looking north from Congo–Shari watershed down into Shari basin

Crossing a ferry in Belgian Congo

Buta sign-board

After Wandu we dropped slowly down into the Congo basin, and during the next 300 miles to Buta we crossed no less than eight ferries. An equatorial ferry is a sort of Heath Robinson scaffolding poised on a flimsy pontoon, which in its turn floats on a fleet of dugouts, each of which is a hollowed half-section of a forest tree. The personnel of the ferries, the pole-and-paddle men, are the jesters of the Congo. Accidents of embarkation or disembarkation, for which they are always responsible, drive them delirious with mirth.

Our road through the Congo basin remained excellent. We were in semi-tropical vegetation: groves of palm trees and fields of bananas, and a few patches of cotton which appeared to my eyes to be thin and straggling. The villages were primitive: square and circular huts, roofed into a point with banana leaves; the natives themselves, though they wore slightly more clothes, were as negroid as the Nilotics. They were extremely well drilled, and when we appeared in the distance they always stopped, faced inwards, and threw us almost Guards' salutes. We reached Buta after four days. It is a sprawling little Belgian *ville de province*. We found a hotel of a kind; a garage where we bought tyres, for the weight of our load had given us three bursts in our back wheels; we bought cigarettes and lime-juice; and we changed a circular note of credit at a bank. But Buta had for us only one real interest, its signboard in the centre of the town. Buta is, as nearly as possible, the centre of Central Africa. Its Piccadilly Circus, with its one-way traffic "Keep to the Right" in French and in Flemish, is worthy of its position.

From the Sudan frontier to Buta our road had, in the main, followed the line of the crests of watersheds. The 280 miles from Buta north to Bangasu on the French frontier, ran head-on across endless watersheds, feeding east to west into the Ubangi and the Congo. The road was a violent switchback far more exciting than the Giant Racer at Wembley, and literally cleft its way between impenetrable walls of jungle foliage. Trees 100 feet high and wall-papered with jungle creepers shut out all air, and during the four hours when the sun was at its height conditions were appalling—particularly for the grocer's van. We would climb a cutting through the forest; and the view from the crest would be a roof of tightly packed green tree-tops. Ahead the road would slope away out of sight. The gradient from being easy would lapse into a 1 in 10; 1 in 8; 1 in 7; and finally, just above a dank, gloomy slow-moving stream, spanned by a tiny trestle-bridge, would plunge at the rate of 1 in 5. We would creep down in bottom gear—for we did not trust our brakes —and get up as much speed as we could on the trestle-bridge to give us an impetus to carry us up another similar ascent on the other side. We boiled and boiled; but, thanks entirely to Captain Crofton's brilliant gear-changing, we did survive, and were, after a day and a half, past the watersheds and dropping easily down to the river Boma. A glee party of black paddlers and pole-men not only sang us across the river, but also sang us up the slope into French territory after our carburettor had choked.

Bangasu, like all the towns which we were to meet in French Equatoria, is a military cantonment turned civilian. Barracks had become shops; the fortress, the civilian headquarters: a few policemen were all that remained of the military past. It was a woebegone place, and in it we heard many woebegone tales of the roads which lay ahead of us. Only the French

Commandant told us to have no fears. But we, being laymen, interpreted his opinion as official optimism; and when next day we left for the north, we literally crept along the road for the first 30 miles. But it was an extremely good road. It ran through open forest and not oppressive jungle country, and it was beautiful. We could see hundreds of yards into alluring shade. The foliage graded from olive-green to brilliant emerald; there was an undergrowth which was fern-like; and every now and then we would come to glades of mossy turf, which might have been in the west of Ireland. Our spirits rose hourly, and as we had jettisoned heavily at Bangasu, the car, thus unburdened, neither faltered nor boiled.

We had ferries to cross, when it would be an excitement to see which way the water was flowing: south into the Congo, or north into the Shari. The forest was gradually thinning on either side, and the country opening up to the north. We were at last out on the highlands of the watershed. The trees were the trees of parks, not of forests; and every now and then we came to great green clearings full of rushes and obviously marshy. Across one we saw a whole family of wart-hog, father, mother and three babies, striding along like hackneys in an alignment. They had all been rolling in the mud; the mud was red mud, and they, instead of being black, were terra-cotta.

The views ahead were wonderful. The country rolled away to the north in a great series of horizons. From the crest of one rise I counted no less than sixteen different distances ahead, ranging from green in the foreground to misty blue on the far horizon, all splashed with great purple shadows cast by fleecy white clouds, sailing high overhead in the blue sky. Away into this vista streamed our road. Bangasu will in time be connected by telegraph with the rest of Equatoria. The posts were already in place, and some have been there for many moons. Many were in full bloom. Periodically we passed villages, all of them tidy and picturesque: their circular huts were thatched with elephant-grass instead of with the banana leaves of the Congo.

Our first camp, 150 miles north-west of Bangasu, gave us and Muhammad an unexpected thrill. I woke at dawn, and saw between me and the glow of the rising sun a tall, heavily robed figure making his prayers towards Mecca: behind him were others, all of them "true believers." I called Muhammad, who in moments of crisis is also a true believer. He was in the Muhammadan camp at once, and through the stillness of the morning we heard the sounds of Arabic being talked intelligently and extremely rapidly over a cup of Turkish coffee. It was our first contact with Arab penetration from the north. To Muhammad it meant that he had found himself again, and was no longer a stranger among strange tongues in a strange land which, for all he knew, might be on the moon. Later the sons of Islam all came to return his call. The headman was a Sudanese, and had been in the army of Ali Dinar, the Sultan of Darfur. Our thrill came after breakfast. Owing to Muhammad's garrulity with his new-found friends we were late, and when we turned out on to the road we saw to our disgust that the ferry below us was on the farther side, loading rather a smart 2-ton lorry, heavily packed and obviously belonging to people on trek. The ferry beached on our side, and as the lorry roared past us up the hill, four interested Europeans looked at each other, two from the grocer's van, two from the lorry. They were from Kano, on their way

to Nairobi; and the four of us fell to discussing roads and people and rest-houses and distances; where you could get petrol and where you could get beer: in fact, all the gossip of the Central African Highway.

Our next ferry was at Bambari. We crossed at dawn. It was the last water we met in Equatoria flowing south to the Congo, and after another 50 miles we were past the crest of the Congo–Shari divide. For a time the country was still well wooded. There were beautiful glades of deep shadow crossed by jolly little burns such as you find in Scotland. We ran through miles and miles of rubber plantations which, during the boom, had brought fleeting prosperity to the colony. We had two beautiful hours in a great bamboo forest which threw lovely filigree shadows across our road and looked like a fairy wood. All the time we were dropping into the Shari basin. Our third day in Equatoria we entered the flatness of the alluvial plains, and our life changed. We were back in the scrub—elephant-grass, spattered here and there with ragged flat-topped thorn bushes, and a going which tested us and the van to the full. To be damaged mechanically or structurally in such a Back of Beyond would be tantamount to a delay of anything up to three months. Equatoria is, in fact, only just fit for motor traffic. The roads are passable, or, as they say on French maps, *automobilisable;* but tyres and spare parts are unobtainable save at Bangi, in the extreme south-west corner of the colony; and petrol is not a case of another pump in the next village. At Bangasu we had to stock for two days to carry us to Bambari; there we learned that, although on our road to Chad we should pass two comparatively important centres—Fort Crampel and Fort Archambault, at neither place could we expect to find commercial petrol, and that we must carry for the whole 700 miles to Lamy. Seven hundred miles is about London to Inverness. The long-suffering van had to shoulder the burden: but somehow it survived, despite the fact that when the load was heaviest, up to Archambault, the road was at its worst. We had league after league of cracked cotton soil: once for four solid hours we undulated over a rolling stairway of ironstone outcrop.

We spent two happy days at Archambault, where we met the Shari, flowing as wide as the Thames below London Bridge, within a few yards of our rest-house. When I was bored with writing, as I often was, I went out on to the bank and watched the come and go on the river. It wound slowly away into the north between low sandbanks leading up to great rank plains. In the middle distance was the town ford. We had arrived at the tail end of the drought; the river was low; and crossing it was a continuous stream of porters carrying kit, merchandise, and clothes on their heads from one bank to the other. In the foreground, at the anchorage itself, I saw the arrival of a fleet of Government barges from Fort Lamy, 380 miles to the north. It carried a French leave-party on their way to France, having completed two years' military service in the Colonial army. They had started from Abeshr, on the Sudan–Equatorial frontier, seven weeks before: it had taken them eight days to get by road to Lamy; and from Lamy to Archambault another twenty-five by river. Their next stage was by lorry down to Bangi, and thence by rail and river to the Atlantic, a matter of 2000 more miles. And all the time they were going in the direction opposite to France. It was as though leave-parties from Khartoum had to travel home by way of Mombasa.

There are few countries in this odd world of ours which are so hopelessly handicapped as Equatoria from the point of view of outside communications. The whole traffic of the country, passenger and goods, has, as things are, to pass through a tiny bottle-neck in the wrong direction. I discussed this unfortunate state of affairs with every French official I met. All told me that now that they held the Mandate for the German Cameroons they might be able to develop a better and a shorter means of egress by the Gulf of Guinea, when money was available; but, meanwhile, all they could do was improve the existing route by native labour. As in the Congo, the native population has been congregated by the main roads. They are made to work, I believe, in lieu of taxation; and, as we had seen in the early stages north of Bangasu, excellent work has been done. But the 700 miles of the Shari basin from Bambari to Chad is a cruel proposition for the government. The population is small: for four months during the rains the greater part of the country is a swamp; for the remaining eight it bakes into the surfaces which we had already sampled. We were told that compared with three years ago conditions had improved greatly, and that motor breakdowns were far less frequent; and that if we returned in another five years it was hoped there would be an all-weather thoroughfare running straight through the country from south to north.

Archambault was like Bangasu and Fort Crampel—and like Aldershot would be if it was decided to change it into a cathedral town without pulling down the barracks. But it was definitely more Arab. We had had torrential rains in the Congo, more, though less violent, at Bangasu and Bambari; and when we were leaving Archambault we were cautioned that they might catch us up any day. So, with the noise of waters in our ears, we hastened on, and for the next two days bumped long and agitatedly through endless dirty yellow and grey scrub, covered with low thorn bushes which looked as though they had been burnt by fire. But there was compensation for our road trials in the shape of game. We were running parallel with the Shari, and travelling as we were, early and late—for our daily stage was 200 miles—dawn and dusk were a sheer delight. Game was moving back across our road from the morning and evening watering in the Shari. We saw wart-hog, whole families of them; gazelle of all descriptions—roan antelope, Uganda kob, bush-buck, water-buck, Duika, Dik-dik; mongoose by the dozen; and enormous schools of monkeys, red, grey, and green. The bird-life, too, was marvellous: horn-bills, river-eagles, demoiselle cranes, hawks, ducks and geese, hoopoes and doves, and of course thousands of the ubiquitous guinea-fowl.

The country we were now in was not only wilder but must also be much wetter. The villages were all fenced with plaited matting—whether to keep their own animals in or to keep wild animals out, I do not know. Probably both. The houses were still circular, but they were roofed with plaited elephant-grass, not thatched: the grain stores, huge daubed wattle jars, were supported clear of the ground on poles, for protection during the rainy season; while the goats and sheep had first-floor accommodation, which they reached by a ladder. And Arab influence was everywhere. There were donkeys and horses, of which we had seen none in the south or in the Congo: nakedness, except among very small children, was a thing of the past. The men wore

white galabias; some of them wore turbans. The women went in for a one-piece garment hitched somehow under their arms and in which, as often as not, a piccaninny would be slung. Our last camp before Lamy was in a superb rest-house fenced with a mud-brick wall, the first we had seen of such architecture. We were guests of the local sultan, who spoke Arabic and French, the former not unlike the Arabic of the Upper Nile, the French like nothing on earth. Learning whence I had acquired my very poor Arabic, he asked me endless questions about King Fuad of Egypt and El Azhar University in Cairo; and so pleased was he with my answers that, in our honour, he organized an appalling fantasia after we had gone to bed, which kept us awake till midnight.

In Equatoria it is almost impossible to find out how far it is to anywhere. The answer is always in hours. But we learned great astuteness in turning hours into miles. The method is to have a look at your informant's legs: if they are long an hour means 4 miles; however short they are it is never less than two and a half. The sultan was a very big man, and he told us it was seven hours from his rest-house to the Shari ferry which would take us across to Fort Lamy. The distance by our speedometer worked out at 27 miles. Those 27 miles introduced us to what we called ant-bunkers. The ants make their hills anywhere, preferably in the middle of the road; when they are high enough and there are enough eggs in them, their arch enemy, the ant-bear, comes along, digs it up, eats the eggs, and leaves a gaping hole. We were bunkered about ten times: twice we were all but wrecked.

We crossed the Shari to Lamy in the only motor-boat ferry in Equatoria, and in another half-hour we were in Lamy itself. It is an odd, tumble-down place, for its tactical importance and its glory departed when Kuseri, the former northern headquarters of the German Cameroons, which lies on the west bank of the Shari, came within the French Mandate.

Lamy represented 2000 arduous miles from Rejaf; we felt we deserved a holiday, and lonely, romantic Lake Chad, only 100 miles to the north, was to be our holiday. The kindly French Governor gave us a guide and a route-map, and we were off next day. It was an extremely bad road, but it lay alongside the last reaches of the Shari, which gave greenness to the scrub and freshness to the air. We had four hours in a perfect zoo. The game was as tame as it was plentiful. Round one corner we almost ran into a Uganda kob, standing in the middle of the road. It only moved, and then at a walk, as we approached on foot to take photographs which were entirely unsuccessful; it retired into the shade and lay down to rest under a thorn bush; when we approached again, it gave us a somewhat pained look, got up slowly, and trotted inland to be quite secure against intrusion. Farther on, for half a mile we were raced by a field of bush-buck, lolloping along beside us in an awkward canter, and, when they were tired, stopping to watch us as we passed.

From Lamy to the lake is a road-and-river expedition. The road ended in a village of conical and untidily thatched huts, and rather than patronize the ramshackle rest-house, we made a wonderful camp in a thorn forest where all the village, of course, adjourned to have a look at us. We broached our plans, and, fortunately, they spoke Arabic; but the result was terrible gloom. They had seen our guns: white men and guns meant, to their minds, red meat for

them. Our river expedition to see the lake struck them as absolutely futile; and it was only with great difficulty that we were able to get from them two fully manned dugouts for the river. We spent two wonderful hours being poled and paddled on a stream as wide as the Thames at Henley. The banks were sedge-grown and topped with good-sized trees, heavily hung with jungle creepers; and birds escorted us all the way—fish-eagles, grey and brown herons, white egrets, some geese, kingfishers, cormorants, and one glorious greater bustard. But sitting like an Indian tailor in a dugout is a hard life in every sense of the word. After two hours we were stiff and sore. Our choice of a halting-place was most popular. It was a fishing village hung with nets and paved with slabs of yellow stinking fish caught in lake Chad. Our crew loved it, as did that of the second dugout, which shortly joined us. They ate solidly for an hour, although we had intended to halt for only ten minutes. At last they were replete, and on we went. Half an hour later we ran into hippopotamus, of which the native afloat is terrified. No sooner did a head appear than the crews started hitting the side of their boats like tom-toms to frighten the animal away, and, without any order from us, the word was "all for the shore." Once there, they begged for red meat. When the escort is native they do not expect to be paid, but they expect meat for the larder. Another hippopotamus rose: Crofton drew a beautiful bead and struck it straight between the eyes. It sank like a stone, and our crews lapsed into the sort of frenzy which greets the scoring of a goal in one of our cup ties. "Mash'allah, what a fine shot! What a wonderful hunter! And did you see how his head went back, and how he sank like a stone? Surely he is dead and we shall have great meat for months to come!" After ten minutes of pandemonium we, by then somewhat bored, suggested, most unpopularly, that we might go to Chad, as the dead animal would not float to the surface for at least four hours. They were highly sceptical, and only when we assured them on our oath, as honest God-fearing Englishmen, that we knew all about the reactions of dead hippopotami, did they consent to continue downstream.

It was piping hot: there was nothing to see, for the papyrus and bamboo were higher than the tallest man. After a time I woke to hear a shout that the lake was in sight. Beyond two low spits of sedge-grown sand stretched an infinite expanse of greenish-brown water, a depressing vista which made me think of flats in Norfolk when the tide is up. There were birds in legion on every spit. They turned their heads to look at us, but only rose when Crofton shot into the air, which startled them into flight, and gave him a shot on the wing. It was extremely poor sport, for without exaggeration they were almost as tame as the pigeons in Trafalgar Square. We shot only three geese, much to the disappointment of the blacks; and then, for we were very hot, we found a shallow where no crocodile could bask undetected, and there had a bathe in water as warm as the Royal Springs at Bath. Our antics did not at all appeal to our crews. What was the point of delaying their return to the dead hippopotamus for a mere wash? We dried ourselves in the sun and then agreed to turn south. Some 2 miles upstream, another and a much larger fishing camp, against which were moored a fleet of curious wattle boats with the high curved prows which are characteristic of Chad fishing, made the men forget all about the hippopotamus. We stayed for three-quarters of an hour; but not merely

to eat. A witch-doctor was in residence, and for the fee of a franc he produced two sticks, rubbed them together, smelt them, rubbed them together again, listened to them, and then announced, what we already knew, that the hippopotamus was dead as a door nail.

Next morning we started back for Lamy. We made another camp in the scrub, and at dusk went down to the river and watched one animal after another having his evening watering. Then another early start, and by noon on April 2 we had said good-bye to the Shari—the most wonderful African river I have yet seen—and had set our faces west for Nigeria.

Nigeria, perhaps inevitably, was bathos after Chad—a dirty grey scrub stretching miles into a dusty horizon. The road was exciting owing to culverts as sharp as Irish bridges. It ran between grey fields, across which were streaked the dingy remains of last season's harvest. We were feeling quite as flat as the country when we reached Dikwa, the British frontier station. Thirty years ago Dikwa was the capital of a sultanate founded by a renegade Sudanese slave-trader, who, having been driven off the Nile by Baker's and Gordon's missions of the 'sixties and 'seventies, had trekked across Equatoria, conquering as he advanced, and had finally defeated the local sultan of these parts. The new-comer's rule was despotic, and his neighbours invited the French, who were already penetrating this corner of Africa, to assist them to remove the nuisance. By a brilliant military feat, the French concentrated three columns—one from Algiers, another from Senegal and another from the Congo at Lamy—and defeated the Sudanese renegade at Kuseri. The British and the Germans participated in the division of the spoils, and Dikwa became a German town. By the Peace Treaty, it and the surrounding country came under British Mandate.

It is some 450 miles from Dikwa to Kano, the capital of Northern Nigeria. We passed through two British headquarters; we saw masses of natives, but could not speak to them because neither we nor Muhammad knew Hausa. We spent one night in a rest-house, and another in a slaughter-house which we mistook for a rest-house. These were incidents; but all subordinate to a far greater interest—the study of our self-preservation. Those 450 miles were far worse, from the point of view of road surface, than any we struck throughout the whole journey to the Niger. The Shari basin had been bad, but our lives were never in danger; on the Dikwa–Kano road we more than once prayed for release. On the map it is marked as a wide pink thoroughfare. On the ground it meanders more or less in a straight line light-heartedly taking in its stride whatever obstacles Nature has put in its way. We were so fatigued when at last we got to Kano that we decided to take three days off to recuperate. They were days well spent. The grocer's van got a thorough overhaul in a local garage, and it needed it. Muhammad had all his hair shaved off, as he said Nigeria was a very hard country in which to keep your wool on. We found a fine railway rest-house with iced beer; above all, we had one wonderful morning in the native city, which must vie with Omdurman for size. It is surrounded by a high castellated mud-brick wall in which are set, at intervals, wide cavernous gates. Within, wide roads have been cut through native quarters; in some places they are tarred. There are lamps in some streets, and in the bazaar we could have bought false pearls or alarm clocks. But this

modernization is only a surface scratch. Kano is a real African town with the most astonishing wild and pugnacious mud-brick architecture I have ever seen. Every building looks a fortress. The Emir's Palace with its gate conceived in Egyptian rather than West African art, the town mosque, the municipal offices, all made me think instantly of sieges and sudden death. But to see what Kano is like one must see it as a whole, and rising within the walls there are two mushroom-shaped hills from which one has a marvellous view over a brown flatness of roofs stretching away to the horizon. As a town Kano far surpassed any other centre of life which we saw throughout the whole journey. Muhammad quite agreed with us. There was no cooking, and he found a coterie of ex-soldiers of the West African Field Force, who had learned Swahili during the campaign against the Germans in Tanganyika.

It is 1000 miles from Kano to Gao on the Niger, where, all being well, we were due to start for our crossing of the Sahara to Algiers. Up to Kano our daily run had averaged 130 miles a day; but in Kano we heard ominous reports of raging sandstorms and the beginning of bad weather in the Sahara, and realized that the sooner we were safely across it the better. From Kano to Gao we averaged fourteen hours a day on the road and a mileage of 205. The roads helped us. From Kano to Zaria, the centre of the Nigerian cotton industry, the road was good: from Zaria to Sokoto, the north-western outpost of the colony, it was even better. If they want to, Nigerian engineers can build roads. And on this good going there was no need to keep our eyes constantly alert for pitfalls ahead, and at last we saw something of Nigeria. Round Zaria it was green and even beautiful country; then, as we advanced north-west to Sokoto, which rhymes with cockatoo, the greenness began to fade, we saw fewer and fewer cotton fields, less and less vegetation, and our last stage in Nigeria might have been the Sudan between Khartoum and Kosti. The Sahara was coming to meet us from the north.

Birnin-Konni, the French frontier station of the Niger Province, is a link in the chain of French administrative posts from Chad through Zinder to Niamei and Gao on the Niger. This chain of forts is connected by a marvellous road. The country is bare and arid; in the first hundred of the 270-mile stage from Birnin-Konni to the Niger we saw only two human beings, and they were camel policemen out on routine patrol. Now the road would swing to the north and snake its way through the fringe of the Sahara; then it would work south again, and for hours we would be in a sterile hilly country of red rocks and dusty thorn and mimosa trees. On our way we passed only three French outposts, pathetic little oases built round three of the rare water supplies in the area. But despite this desolation the road was always good, and our progress was surprisingly regular. The French authorities have organized a scientific and most ingenious road service for its construction and upkeep. There are heavy seasonal rains. After the little rains the crops are planted; but until the great rains are over, three months later, the native cultivator has no work to do in the fields. During this period native labour is organized by Government for road work. One half of the population works between the small and the great rains, collecting stone and earth and dumping it by the roadside. When the heavy rains descend, those who have been working are dismissed, and the other half of the population is mobilized under French

Native village on northern slope of Congo–Shari watershed, French Equatoria: huts thatched with elephant grass

Arab village in French Equatoria: roofs of plaited elephant grass

The Shari at Fort Archambault

An arm of the river near Lake Chad, showing native wattle fishing boat

engineers, to distribute the dumps on the track, and while the rain pours from above, to stamp and puddle the stone and earth into an even surface. When the rains are over all are free for the harvest, and the sun bakes the result of their roadmaking labours as hard as brick. The system has been in vogue for some five years, and already a causeway has arisen almost 2 feet high even in the sandiest places. Another five years should see it another 3 feet higher, when culverts can be made and wash-outs prevented. The road will then be all-weather proof. The labour is in lieu of taxation; the material costs nothing and is available. The French certainly know how to make roads ingeniously and cheaply.

After a day and a half in this wilderness the sight of Niamei and the Niger was extremely welcome. Two years ago government was, for convenience of administration, transferred from Zinder to Niamei, and in those two years what was but a tiny fishing village has blossomed into a tidy little town, with wide streets, good trees, and squat solid little houses. The Niger at Niamei is nearly half a mile across. We saw it at low river edged with the same bands of riverain cultivation as there are on the Nile. But we had no time for exploring Niamei. Muhammad was seriously ill and reacting to the approach of the Sahara much more acutely than we were. When we left Niamei on the last stage of our journey before the Sahara, he was a complete passenger on as good a bed as we could make him in the rumble, where we advised him to sleep as much as he could until he felt better.

The road from Niamei to Gao runs for 300 miles parallel with the Niger. We saw the rapids at Labazenga where the stream may one day be harnessed for irrigation. We had wonderful views, especially at dawn after our only camp, when we might have been on the Nile at Luxor. Muhammad recovered remarkably, and the car ran beautifully. But after 250 miles of happy satisfactory going, the road petered out and we had our first experience of those sand troubles with which we were to become so acutely familiar a week later in the Sahara. After Ansongo, the last post before Gao, our track plunged headlong into a rolling system of red sand-hills. As a result of delays, it was dark when we got into Gao, and the night was a Saturday night. All the French officials were at a party, and we could find no one to show us the rest-house. We did not allow that to worry us long. Gao's main street is as wide as our Regent Street, and there are no buses. We camped, beds and all, opposite the local Liberty's, and slept the sleep of ten tired men.

We had been a month to a day covering the 3500 miles, Nile to Niger, Rejaf to Gao. A week later we were safely across the Sahara, in another ten days we were in Algiers, and on May 13, after crossing France, we were in London, complete with grocer's van and an entirely restored Muhammad.

DISCUSSION

Before the paper the PRESIDENT (Col. Sir CHARLES CLOSE) said: Before I introduce the lecturer I should like to refer to a piece of news which you have no doubt seen in the papers to-day, namely, the account of the very remarkable Polar flight which has been successfully accomplished by Commander Byrd. The Council of this Society, acting in your name, has sent a message of congratulation to Commander Byrd, and we hope it will reach him directly through the air from Rugby. If it does not meet him in that way it will reach him in other ways. At any rate, in

your name and in the name of the Society we do heartily congratulate Commander Byrd on his very remarkable achievement.

The lecturer this evening is Mr. Owen Tweedy, who, after various experiences of a very interesting kind during the war, became Assistant Oriental Secretary to Lord Allenby at the Residency in Cairo. He has travelled much in Africa, and he will describe a journey which he took in a motor-car from Rejaf on the Nile to Lake Chad, thence to Kano, and from there to Gao on the Niger. The later part of the journey, from Gao to Algeria, he will not describe, because he gave us some indication of it on a former occasion on which he appeared on this platform. But we are anxious to hear what he has to say upon this very considerable journey by motor-car from the Nile to the Niger and then on to Algiers. In fact, it is a journey of many thousands of miles across Africa: a journey of three men in a car. It was with Captain Crofton and, I understand, a person of admirable character named Muhammad, the cook, that he went, and we shall hear more of Captain Crofton and, no doubt, of the cook in the course of the lecture.

Mr. Tweedy then read the paper printed above, and a discussion followed.

Captain CROFTON: There is one thing I would like to do with regard to the journey that Mr. Tweedy has described, namely, to draw attention to the amazing good temper that he showed, because, as you may imagine, driving a car from half-past nine in the morning till about 7.30 in the evening over some of those roads is at times annoying and apt to make one snappy. The way he put up with me was beyond belief. Apart from that I would like to say something about the car. There was nothing at all about it in the way of special fittings; it was just bought in the ordinary way in Alexandria. As to what it looks like now—well, I sold it to a friend of mine in Scotland. I have stayed with him since; he still uses it, and we changed the sparking plug last September for the first time since I bought it.

One of the things you notice on a journey of this kind from east to west is the way people differ in physique; and the most extraordinary thing in Africa, when you get in country where there is stock, outside the fly belt, is the magnificent physique of the natives. You will notice that the fighting tribes of Africa are all cattle people, which means that they live on sour milk, blood, and meat. In the Congo you see the miserable smaller type, such as were seen in some of the photographs; they have no physique at all when compared with the natives round Lake Chad. It is extraordinary how a diet of milk and meat makes for fighting men, and there is no better friend to one than a good savage before he has been upset in any way.

Sir HENRY FOWLER (Oversea Transport Directing Committee): I have to thank the author for the kindness he has shown me personally and the Committee which I represent, in the many photographs which he showed of roads actual and so-called. I am a member of a small Committee which has been appointed to direct the Committee who deal with the question of motor transport in the colonies generally. Although we have met and interviewed very many officials from our various colonies we have not gathered the information which we should like with regard to roads, because, after all, it is for them that we are trying to design certain cars. The object of the Committee is to help as far as possible to develop the undeveloped parts of the Empire. It is necessary to have motor transport because it is impossible to lay railways everywhere, and railways have to be fed; the way in which we trust we shall be able to feed those that are laid is by producing certain car units. At present we are working particularly on two: one in which the load in the individual unit shall be 15 tons, and another in which the load shall be 40 tons. Later we hope to go even higher.

Then we are at once met with the question of what we are to provide in order that we may have sufficient tractive effort to carry the vehicle along whatever road exists. I wrote a short paper for the meeting of the British Association in South Africa, in which I suggested we should legislate for a gradient of 1 in 10. Mr. Tweedy spoke of 1 in 6. One of the kind friends who debated this subject at Johannesburg said I should arrange for 1 in 2. I believe the suggestion that the road should be graded was treated with considerable scorn. I think Mr. Tweedy will appreciate the problem that we have on this very essential question of transport, which, we believe, is going to help very materially towards the development of the Empire.

I have not been so afraid of the roads that we have seen on the screen, but I was afraid when Mr. Tweedy spoke of his hurry to get away from the rains. Some of my friends who went from Cape Town through to Egypt after the British Association meeting did wonderfully well until they met a sudden thundershower; then they were thankful there were footboards on the car, otherwise they would have lost it altogether. It is not only a question of roads but also of bridges. What we have in mind could not possibly get across the watercourses he mentioned. In many British Colonies there have been efforts made to build low bridges, so that when there is a flood the water goes over the top of the bridge; and other ways of overcoming the difficulties have been tried. Personally I thank Mr. Tweedy very much indeed for the information that he has given to the stay-at-home man of the Committee—myself—in the photographs which he has shown.

The PRESIDENT: The valuable lecture to which we have listened this evening has given us an idea, if we needed it, of the extent to which Europe is taking charge of Africa and of the extent to which Africa is becoming Europeanized, and perhaps I might almost say vulgarized. It is a melancholy thought, perhaps, that the great journeys which were undertaken by the early travellers at so much pains and trouble may now be undertaken, I will not say with great ease or comfort, but with relative ease. The fact remains that Africa is now becoming almost a part of Europe. I do not want to give the impression that you would have the comforts of London when travelling in Africa, but you would have many more comforts now than thirty years ago. I think that as we have entered on this task, particularly as the British Empire is very largely responsible for a great deal of Africa, we are bound to carry it on and render our efforts as effective as possible. We are glad to hear from Sir Henry Fowler about the Committee which is studying the question of transport in Africa. I think, if I gathered correctly from the lecturer's remarks, the roads, at any rate in the north-eastern part of Nigeria, leave something to be desired. If that Committee carries home that idea perhaps it will produce some effect later on.

I dare say many were most interested, as I was, in the pictures of the Shari, which some, according to the lecturer, had never heard of before. What we want to know is what is happening to Lake Chad, which sometimes seems to expand, and sometimes to dry up. What is the general tendency? I asked Mr. Tweedy before the lecture if he knew anything about it, and he said his short visit of a few hours did not give him an opportunity of pronouncing an opinion on the subject.

We have all listened with very great interest to the lecture, and I am sure in your name I may thank Mr. Owen Tweedy and Captain Crofton for what they have told us to-night.

A RECONNAISSANCE OF THE GREAT MAKARIKARI LAKE

CAPT. THE HON. B. E. H. CLIFFORD, C.M.G., M.V.O.
Imperial Secretary, South Africa

THE experience of the Kalahari expedition of 1928 (*Geogr. Journ.*, April 1929, 73, 342) indicated that, owing to long stretches of heavy sandy country between the railway and the dry bed of the Okwa river, conditions were unfavourable for a motor transport route through these regions to the west. It is true that the principal difficulties encountered by the expedition were in the main due to punctures, but even if these could have been avoided the heavy going would have rendered transport costs exceedingly high. It was therefore decided to endeavour to obtain water along this route in order to use it for cattle, and to search elsewhere for more suitable country along which to organize a line of communication across the Protectorate from east to west.

During recent years a strong association had been formed in Southern Rhodesia which favoured the construction of a railway line from that colony to Walvis Bay. Information already available indicated that no serious obstacles need be anticipated south-west of the Botletle River, but to the east and north-east of that stream it was known that the Great Makarikari Salt Lake, which is partially flooded every year, sprawled over a vast area of country. It had been shown vaguely on maps from earliest times; but its shape, the limits of its boundaries, and the extent to which it might be regarded as an obstacle to railway construction, were unknown. It was clear that until the boundaries of this lake were definitely fixed all suggestions regarding the route which a railway to Walvis Bay should follow must be purely speculative, and as a consequence the cost of such a line could not be estimated, nor could its general direction be safely predicted.

Professor Schwarz's schemes for the irrigation of Crown lands in these regions had aroused interest, and the Protectorate Authorities desired to obtain information regarding the general nature of the country. It was also thought that the hard surface in the neighbourhood of the lake offered the best prospects for establishing a motor route to the west. As an outcome of conversations between the Governments of Southern Rhodesia and the Bechuanaland Protectorate the present joint expedition was organized with the object of studying the questions referred to above and accurately fixing the boundaries of the lake. The Imperial Secretary was placed in charge of the expedition and undertook to carry out an astronomical survey of sufficient accuracy to fix with reasonable precision the boundaries of the Makarikari Lake and to control the very rough compass survey of the route traversed. Mr. S. P. J. Fry, of the Rhodesian Railways, accompanied the expedition to report on problems in connection with railway construction, and Mr. Macgregor, of the Southern Rhodesia Geological Survey, was commissioned to report on matters of geological interest.

The expedition left Francistown on June 25. The scientific equipment included a wireless set for picking up time signals, a carefully regulated

chronometer, a theodolite reading to seconds, and the usual assortment of aneroids, prismatic compasses, etc. The daily waves of the aneroids were carefully plotted before leaving Francistown, and arrangements were made at Bulawayo for a careful barograph record to be kept during the absence of the expedition.

We crossed the Vukwe river drift, 20 miles out, without much difficulty. At 48 miles the Shashi river drift was negotiated, and the expedition then headed westerly towards the Old Bushman Mine, which was reached at 103 miles, over what had once been a comparatively good road, but had become very difficult in places owing to washaways, fallen trees, and overgrowth, which made pick, shovel, and axe necessary in places. Although the road to the Bushman Mine has not been much in use lately it could be transformed into a serviceable road at very little cost.

The country was *mopane* forest of varying density, comprising a watershed running more or less north and south between the valley of the Shashi and Tati river system and a maze of small streams and dongas flowing southwestward into the Great Makarikari Lake. After leaving the Bushman Mine the road became indistinct and passed through a succession of open vleis and sandy islands. The open vleis were composed of dark loam with occasional outcrops of limestone or quartzite gravel: though readily negotiable in dry weather, they would constitute a serious obstacle to motor traffic during the rainy season, but an all-weather route could easily be blazed along the low mopane ridge which ran parallel to our course a few miles to the south.

Along the Shashi river and for some distance west the natives were of the Bakhurutse tribe. They appeared to be an enterprising people with a disposition to cultivate the land, and in many places we saw tobacco crops of a rather inferior grade. As we proceeded westwards Makalakas predominated, and we passed through numerous cattle posts and cultivated lands. The loamy vleis to the west of the Bushman Mine were, however, uninhabited, and it was not until we reached Simowana river that we encountered native cattle posts; but there were no longer any signs of agricultural enterprise.

At 126 miles we struck the track running along the east shore of the Makarikari Lake from Serowe to Nkate. We followed this track southerly for a couple of miles until we again struck the Simowana, where we took in a supply of brack water for cooking and washing. We then retraced our steps along the Serowe–Nkate road until we struck the Makarikari Lake at 132 miles, which, allowing for the detour, makes a total of 128 miles from Francistown. Here I took astronomical observations and located the point where the road from the Bushman Mine touches the edge of the Lake in co-ordinates which, according to the 1913 Map G.S.G.S. 2861, which may be regarded as the most accurate available to-day, put us already nearly a quarter of the way across the lake. Owing to the heavy rains in Southern Rhodesia this portion of the lake was flooded with water brought down by the Nata and Mitengwe rivers. From the point where we had first struck it we proceeded northwesterly across an arm of the lake which was dry now, but which the natives stated had been flooded a few months before. We encountered occasional pans covered with the white saline crust characteristic of the lake proper, but for the most part this particular arm was grassy vlei showing evidence of

recent submersion. Normally, the Bushmen told us, the road proceeded in a westerly direction across the lake, but owing to its flooded condition this season and because we were anxious to determine the northern limits of the area subject to submersion, we made a detour to the north.

Sixteen miles along this detour we encountered the Nata river near a place called Makwena Yan. On the way we passed a lonely tree in the middle of the open plain which the natives call the Battle Tree, since it is alleged to have been the scene of a conflict between two sections of the Mangwato during Chief Khama's time. The northern limits of the lake arm which we had just traversed could be discerned about 8 or 10 miles away. Here we were met by a representative of the chief Tshekedi, who had passed us the night before on his way to the Nata, where he had instructions to turn out the inhabitants to greet us, and to provide oxen to tow us across the Nata or, as it is known in these parts, Shua river. It was an ominous-looking stream and, judging from the rubbish collected some distance up the trees on its banks, it must have recently been in high flood, when I should estimate that it ran at a depth of between 15 and 20 feet. The drift as we saw it would be about 60 yards wide from bank to bank.

There were no evidences at this particular place of rock foundation, and the railway expert estimated that at least a 600-feet span would be required to bridge it with a reasonable margin of safety. It is possible that a much better crossing could be found elsewhere; but at the moment we were concerned with the general feasibility of a route rather than the location of the best. There was not very much water running down the river so our Thornycroft lorry headed for the opposite bank amidst shrieks of delight from the natives who had gathered to witness our passage. Everything went well until we reached the steep rise of the west bank, when the wheels failed to grip in the bluish, slimy clay. Here, having sunk axle-deep, we proceeded to level off and corduroy the track up the slope. We still, however, failed to obtain a satisfactory gripping surface for the wheels, and called upon the natives. With their assistance, more elaborate "corduroying," and the use of the lowest gear, we at last succeeded in getting the lorry out of the slime into which it had been sinking at an alarming rate.

After blazing a tree on the west bank to mark the position of this drift, which the natives called Madsiara, we set out westerly across open grassy veld of excellent quality. We had left all trace of a road behind us from the point where we first struck the lake, and the grass tussocks over which we were now passing were extremely bumpy. But the Bushman whom we had taken on as a guide contrived to make himself comfortable, seated on a hard packing case, with his knees tucked up under his chin, his haunches forming an acute angle with his body. I gathered that our Bushman must have very serviceable corns and a specially designed base to put up with ten hours' continual jolting in a position which he assumed apparently from choice.

After having passed through grassy plains over occasional patches of stunted mopane, at 32 miles west we struck a waggon track running north-easterly towards Nkate along which we proceeded for a few miles. We passed an enormous baobab tree 42 feet round into which the natives had driven wooden spikes in order to enable them to climb its smooth trunk. On inquiry

we found the tree to be of historic importance amongst the local inhabitants. It was known as the Baratani or Lovers' Tree, and the legend is that the local Hero challenged her dusky Leander to prove his affection by climbing the tree. With the utmost difficulty he succeeded in reaching the place where the gigantic trunk disperses into branches, but here he inadvertently slipped into an enormous hole in the centre. From this prison he called to his lady outside, imploring her to rescue him. She shouted back directions and encouragement, but either through dilatoriness or lack of interest in his fate no effective steps were taken to rescue him, with the result that he finally died of starvation, and the natives allege that his bones are there to this day and may be seen by all who are willing to risk their necks by climbing the crazy structure which has been erected to assist those whose curiosity or interest in the episode is sufficient to tempt them to undertake the exploit.

In this neighbourhood we passed some of the finest grazing I have ever seen, and took samples of the soil. The grass was not the tall rank variety usually encountered, but a shorter kind which was quite green round the base of the tufts from which it grew, indicating moisture fairly close to the surface. At 40 miles from the Nata we came to Mumpswe Pan, a fresh-water spring issuing from the limestone which the natives report never dries up. Herds of springbok and wildebeeste and zebra grazed fearlessly on the magnificent veld, which extended in a dead flat plain as far as the eye could see. The country was treeless in places, but there were frequent patches of bush and numbers of baobab trees.

Occasional Bushman stads were encountered, and, very rarely, a few head of cattle. Here apparently the Masarwa Bushmen roamed in absolute freedom, their diet, except when amplified by the hunt, consisting entirely of berries and the flour-like substance which grows round the beans inside the immense pods of the baobab tree. On inquiry we were informed that the ownership of the fruit of these trees is by no means promiscuous. It is in many areas strictly prescribed, certain trees being recognized as the property of definite families of Bushmen. It would seem evident that the sanctuary afforded by these vast areas of Crown land is available also to those Bushmen who act as herds at the Mangwato cattle posts. Indeed, I can see no reason why the Masarwa who are engaged in herding the cattle of their so-called masters should not, if they felt inclined, desert this occupation and join their compatriots in the Crown lands. But the task of looking after cattle in an area where the limited water supply ensures that the animals will not stray, is one which demands little if any exertion on the part of their guardians. At sunset the cattle appear to return from the outlying veld to the cattle posts, where they are watered and kraaled for the night. Next morning when they are released from the kraals they will wait around until they have again been watered before they trek abroad to graze. Their Mangwato owners live at Serowe or some other large stad, and as they can make no use of the milk at such distance it is consumed by the Bushmen in return for their services as herds. The average Mangwato makes no effort to disguise his contempt for the Masarwa, but in the absence of any supervision there can be little opportunity for oppression. On the whole, I am inclined to believe that the Masarwa prefer the more congenial existence of herding the cattle of the

Mangwato and having an assured supply of milk to the harder struggle for food which is the lot of those who roam free over the Crown lands.

Owing to the uniformity of level of the country in these regions we were able by climbing into the branches of trees to obtain a wide view of the landscape and vaguely to discern the northern shore of the lake running east and west some 7 or 8 miles south of our course. At 60 miles from the Nata river the vastly wooded nature of the country gave way to an open plain, and at 62 miles we encountered an offshoot of the lake running north-east. This arm of the lake, which the natives call Moakomoto,* is really a series of long pans which, though not always connected with one another may be regarded as generally continuous. Where we crossed the pans were about 5 miles wide and disappeared from view to the north-east. The natives informed us that they ended at a place called Metse Matlukou,† which they said was about two "treks" (oxen) away. We considered these pans a serious obstacle to a railway and motored north along Moakomoto for about 5 or 6 miles, finding that this arm of the lake narrowed rapidly until we came to a place where it was only about a quarter of a mile wide and was interspersed with numerous grass islands. The railway expert was of opinion that it presented no obstacle and could be easily crossed by ballasting with occasional culverts. It would appear that owing to the dead level of the country, there can be no scour from running water even in the rainy season. The depths of the pans are seldom more than 18 inches to 2 feet below the grassy surface of the plain from which the arm provides a seepage drain into the main lake to the south. Professor Schwarz had never seen Moakomoto, but he is apparently referring to it when he speaks in his book 'The Kalahari and its Native Races' of a channel which drained into the lake from the direction of Metse Matlukou.

At a suitable point on this vast plain I carefully levelled the theodolite and took reverse sights to the north and south horizons. There appeared to be a very slight fall to the south, but the difference in level across our field of vision, which was presumably only limited by the curvature of the Earth, amounted to only 43·5 seconds of arc. We resumed our journey in the direction of a distant clump of trees as, since night was coming on, we were anxious to obtain wood. Our Bushman guide displayed a strong antipathy to spending the night near the small wood for which we were making, and upon being questioned he informed us that on a previous occasion when he rested at this place, which the natives call Mangana, a lion had carried off his donkey. However, we enjoyed a quiet and undisturbed night here.

From Mangana we continued next day slightly south of west until we encountered rising ground and limestone outcrops, shortly afterwards striking a permanent fresh-water hole at a place which the Bushman called Kadi. Game was apparently plentiful in these parts; we came across many quaint Bushman devices for entrapping small game, and near Kadi Pan they had dug a hole in the ground and erected a sort of wood and limestone block-house slightly above the level of the earth from which, we were informed, they shot at game which came to water. The block-house, we were told, was to protect the hunter from lion and large game wounded at close quarters by ancient and inefficient weapons. From Kadi we turned in a more southerly

*Spelt Mokoamoto on the writer's map. †Metsematuko on map.

The Nata river

Flooded portion of Great Makarikari Lake

South-east corner of lake showing dry saline crust

The Giant Baobab called "Baratani" or Lovers' Tree

Bushmen making fire

Young giraffe and zebra at Rakops

direction along the limestone ridge, reaching the shore of the lake at 115 miles from the Nata river.

The next morning we motored on to the lake, which at this point contained no water, and finding the surface hard, set out at a good pace for some grass islands visible in the distance. We had not been going very long before the firm saline crust of the lake gave way, and the car, sinking to the axles, came to a standstill. We all tumbled out and realized at a glance that our position was critical. In the foreground the surface of the salt lake resembled an Arctic snowscape against which the figures of our party were projected in black silhouette. Farther away the dry white saline crust appeared to be transformed by mirage into a vast sheet of mercury-bright water which extended eastwards as far as the eye could see. Here and there great spirals of dust were being sucked skywards by wind devils. To the south, beyond the little grass island near which we stood, the lake's surface again merged into a phantom sea, while on the western horizon a few tall palms, lifted high above the shimmering "waters," danced grotesquely in space. Only from the direction in which we had come was the shore visible.

The task of extricating the lorry turned out to be extremely difficult. There was no wood, scrub, or grass anywhere near to serve as a corduroy, but we fortunately remembered that we had a number of thick pine planks which were being used as decking to separate the rows of petrol tanks. With the aid of these we were able to obtain sufficient surface to jack the wheels of the lorry out of the mud. We then filled in the holes with shovelsful of the dry saline crust and placed other planks underneath the wheels to form a track. In this way we were able to back out of the mud, putting down fresh planks about every 8 feet. It was a long and tedious process, and as soon as we got the car back on to the hard surface we decided to put on the caterpillar tracks. We discovered, however, that these were quite useless in the bluish slimy clay which is frequently found beneath the hard saline crust of the lake. If anything, they dig the car in faster than the ordinary wheels. The planks proved our salvation on many future occasions, and indeed it is probable that without their assistance we should never have been able to get back to hard land.

We decided that it was impossible to proceed any farther into the lake, and we returned in our tracks along the limestone ridge.

We travelled north-west through thick mopane and mochare veld for about 12 miles until we encountered a track which led us to a well called Sagara, where we found fresh water which the Bushman reported never dried up. Here we took on a new Bushman guide, who conducted us to a place called Gwata, which is shown on the 1913 map, where there is also a fresh-water well. All these pans appear in limestone formation. Large pieces of quartzite were found embedded in the limestone, creating the impression that the latter mineral had been formed in place by a process of evaporation.

At Gwata the Bushmen informed us that there was a road running in a southerly direction through Chuma Pan towards Rakops, but that it passed for some 5 or 6 miles across the Makarikari Lake. We were not anxious to have a repetition of our previous experience, since it was evident that with a lorry as heavy as ours we were certain to sink into wet patches whenever we

had to traverse any large section of the lake. We accordingly told the Bushmen that we wanted to proceed as directly as possible towards the Botletle river without having to cross any portion of the lake. They replied that it was impossible to avoid the lake unless we took the road to More Mawiutu, which we were very reluctant to do as it was a long way out of our course. After much tedious cross-examination aided by diagrams drawn in the sand, I was able to discover from the Bushmen that it was possible to strike the Botletle somewhere near Menokwane by crossing a portion of the lake where it was only about a mile wide. We accordingly set out almost due west, and a few miles out encountered sandy undulating country with low scrub.

After about 35 miles of heavy going we crossed a sandy ridge and descended into an open treeless plain which was apparently the floor of the lake. Through the middle of this plain numerous connected and disconnected saline pans were interspersed, their general direction being southerly on our left and north-westerly to our right. I concluded these pans were a north-westerly protraction of the arm of the lake, which appeared to extend along the general bearing of 345° magnetic from the place where we had stuck two days before. At the point where we crossed it would seem to be some 35 to 40 miles from the Botletle River, and it appeared to me quite possible that it might be part of the depression which, according to Professor Schwarz, connects the Great Makarikari with the Mbabe flats (see 'The Kalahari and its Native Races,' p. 108). We found that these pans were very narrow in places and quite shallow everywhere, and concluded that they would offer no serious obstacle to railway construction and could be negotiated by ballasting and culverts in the same manner as the Moakomoto arm which extends towards Metse Matlukou.

After crossing this arm of the lake we continued westerly until we came to a well dug by Damaras at a place known by the Bushmen as Tubuki.* The water which was described by the natives as fresh was, like all water in these regions, decidedly brackish. After passing the well we encountered typical sandy Kalahari veld, and our progress was very slow. Observations which I took that evening showed that we were travelling almost due west and would appear to be running parallel to the Botletle towards Maun. Our native guide wished to continue in this direction, but we refused to listen to him and turned due south. After some time we struck dense thorn bush, which we penetrated with the greatest difficulty, but fortunately before we had endured it for more than a couple of miles we struck the Botletle at a place named Namissan, where there was a hard sandy drift which we crossed without difficulty. Here the native informed us that along the east bank of the river the Kalahari sand belt continued practically the whole way to Rakops. The west bank, though somewhat similar country, was not so densely wooded. We accordingly crossed the drift and decided to make for Rakops via the west bank, thus cutting across instead of having to go round the long elbow of the river which extends north-east.

We continued along the west bank of the Botletle at a very slow pace across the same variety of Kalahari sand belt. Tufts of grass made the going very bumpy, and the ground was undermined by veld rodents and ant bears.

*Tubukai on map.

Before reaching the village of Sesume we left the Kalahari sand belt. The Botletle, which had previously flowed in a narrow channel between sharply defined banks with occasional limestone cliffs, debouched into the flat open plain of the Makarikari depression. We spent a day in Rakops, and left the next morning for Mopepe via Gomo in a blinding duststorm. These storms are apparently common in July and August, and so dense was the dust that at times we could scarcely see the radiator and had to halt until there was a temporary abatement of the wind and the road ahead became visible.

Although we passed a number of backwaters in the neighbourhood of Rakops on the south bank of the river, none of them appeared to me to justify the conclusion that they marked, as Professor Schwarz contends, the point where the Botletle used in former times to discharge its waters into the Okwa or Letyaho. I regard the Makarikari as an enclosed depression into which these rivers, now dry, used formerly to flow. To-day the bulk of the water flowing into the lake is supplied from the Nata. Professor Schwarz does not support the enclosed depression theory, but contends that the lake used to discharge its waters via the Letyaho and Okwa south-westerly into the Molopo or Nosop, and he maintains that the beds of these rivers are connected with the Makarikari lake by a depression extending across the Kalahari from Rakops to Lehututu. Native Corporal Moses, of the Bechuanaland Protectorate Police, who has spent all his life in the vicinity of Chanzi and Lehututu, and who has relations in those places, assures me that the Damaras inhabiting the south-western portion of the Protectorate relate that in the lifetime of some of their older men the Okwa was a broad stream and actually flowed in the direction of Lehututu. In the absence of levels these statements, and Professor Schwarz's theory that the Makarikari depression was at one time connected with the Molopo and Nosop, cannot be substantiated or refuted. As already stated, however, I am inclined to favour the view that the Okwa river drained the high ground round Ghanzi and flowed in a north-easterly direction into the Makarikari depression.

When the floods come down the Okovango there is a consequent rise in the water-level of its marshes in Ngamiland, and this rise in level causes an overflow in three directions. Some of the water flows south-west towards Totin and Lake Ngami. Some flows northwards along the Tamalakan towards the Mbabe flats, which are now perennially dry, and the balance finds its way very slowly along the Botletle towards the Great Makarikari depression. The level of the country is however so uniform that it takes a very long time for the water to reach Mopepe, and when it arrives at that village a rather curious action takes place. The water does not, as one might expect, flow on down the main channel to the Makarikari, but turns southwards into a large depression known as Lake Dow. When it has filled this lake it flows back again into the Botletle. Beyond Mopepe, however, the channel of the Botletle becomes ill-defined and degenerates into a series of saline pans connecting with the Makarikari lake. The flow through these pans is naturally exceedingly slow, and during average seasons the water is unable to penetrate very far along them, because before it can do so the waters in the Okovango marshes recede and the Botletle reverses its course and flows back towards Ngamiland. When we crossed the drift near Namissan the

little motion there was in the waters indicated that they were flowing westerly towards Ngamiland. This could not, however, have lasted much longer, because the natives informed us that the flood waters from the Okovango marshes had begun to move eastward along the Botletle and had reached the drift at Makalamabedi. One had therefore the unusual phenomenon of a river flowing in opposite directions at two points in its course not 50 miles apart.

After leaving Mopepe we crossed the now ill-defined channel of the Botletle from the Bamangwato Reserve into the Crown lands, reaching the village of Gominyan 20 miles from Mopepe about sunset. The going had been exceptionally good since Rakops, and in spite of the duststorm and numerous halts we covered 57 miles that day. From Gominyan we proceeded easterly, and an arm of the lake was visible on our left at distances varying from 400 yards to a mile. About 7 miles out we lost sight of this arm of the lake, but at 35 miles we crossed a low plain and could discern the main Makarikari Lake a short distance to the north of our course, which at this stage was practically due east.

The natives told us that Pampi's village, which on the 1913 Map is shown on the road between Mopepe and Gominyan, is really some distance south-east of Mopepe on Lake Koa. They pointed out the road to this village, and it would appear that the mistake in the position of Pampi's village on the map is due to the fact that this headman has a cattle post at a place called Matanyika, 12 miles along the road from Mopepe to Gominyan. It will be remembered that 2 miles out of Mopepe we crossed the ill-defined channel of the Botletle, thus passing from the Bamangwato Reserve into Crown lands. It is quite possible that without realizing it we subsequently re-crossed the river into the Bamangwato Reserve, since its course from Mopepe to the Makarikari is a series of pans which are not always very obviously connected up with one another. When I questioned the natives on this point, however, they told me that the village of Gominyan was in fact in Crown land, and that the arm of the lake which we crossed about 6 miles east of Gominyan was the depression which connected the Botletle with the Great Makarikari Lake. The course of the Botletle, which forms the boundary between the Bamangwato Reserve and Crown lands, was in these parts almost impossible to discern, but as a wounded arm was giving me a very great deal of trouble I regret I was unable to stop in order to make a careful investigation. I have no reason, however, to doubt the statements of our native guides, and I have accordingly placed the village of Gominyan in Crown land north of the Botletle, and not on the south bank, as shown on the 1913 Map.

We continued on an easterly course for about 40 miles beyond Gominyan through good veld, encountering a number of cattle posts and fresh-water wells. It was noteworthy that along the Botletle between Gominyan and Namissan drift the Makobas and Makalakas made no attempt to dig for water inland from the river. Their cattle moved inland to graze by day, but every night they were brought back to the river for water, and were kraaled along its banks. The result was that the grazing close to the river had been practically trampled and eaten out, the small stock literally tearing up the roots of the grass for nourishment. Our experience showed us that owing to the dead level nature of the country surrounding the Makarikari Lake, water could

usually be found within a few feet of the surface, but apparently laziness and a dearth of tools resulted in most of the natives over-grazing the country in the vicinity of the river when fresh pastures might easily be provided farther afield by sinking wells for water a few feet beneath the surface. Beyond Mopepe the water supply in the Botletle became so precarious, owing to the absence of a defined channel, that the natives have been compelled to sink wells in order to obtain water at all.

Forty-four miles from Gominyan our course took a decided bend to the south as we followed barely discernible tracks which our native guides assured us led in the direction of the south-east corner of the lake, which we reached at Mouchu (Mouchi on map). The latter part of the journey had been through very dense bush, and as we neared the lake we crossed the saddle of a granite ridge and descended on to the level of the Makarikari which here, in marked contrast to the other shores, was bounded by a steep escarpment between 300 and 400 feet high. Granite and basalt outcrops were encountered, and occasional dykes struck across the pans bordering the edge of the lake proper. In several places we came across deposits of coal shale.

Our course now lay across a gulf which projected from the extreme south-eastern corner of the lake, and as we were anxious to get back as quickly as possible we decided to attempt to cross this protrusion rather than add many miles to our journey by attempting to circumvent it. However, after our past experience of the lake mud we decided to take every possible precaution, and a party was sent ahead with a spade to dig up portions of the surface and to examine the nature of the sub-soil. Although these tests were not very reassuring we decided to take a chance, and set out at full speed across the saline crust. We struck three or four bad patches, and at times it looked as though the lorry was going to sink up to the axle, but fortunately the impetus we had on was just sufficient to carry us over these wet patches, and with feelings of the greatest relief we reached the opposite shore.

We then travelled inland for about 8 miles, after which we struck the track running from Serowe along the eastern shore of the lake to the Nata. We had now turned north, and the well-defined shore of the Great Makarikari appeared at intervals on our left. Longitude observations showed us still some distance to the west of the point where we had first struck the Makarikari Lake coming from Francistown, and which we were now endeavouring to make on our return journey. I began to think my chronometer must have suffered some serious disturbance during the journey when the road began to take a decided bend to the east. Latitudes and longitudes taken that evening, however, showed us to be about 7 miles from the point where the road from the Bushman Mine first strikes the lake, with a difference in longitude of only about two minutes. The actual closure indicated that in our long journey of 500 miles round the lake our astronomically controlled traverse left little or no margin of error, indicating that the chronometer had maintained a wonderfully steady rate throughout in spite of all the bumping and jolting to which it had been exposed. I should like to record here that we treated our chronometer with the utmost care. The box in which it was contained was put into a packing-case filled with shavings which were kept continually stirred up and which acted as a cushion to absorb any impact. Owing to the

uneven nature of the road the chronometer had been swung on its gimbals throughout the journey, while the packing-case in which it was stowed was given an honoured place in the most comfortable portion of the lorry. On my return to Cape Town I obtained signals from the Royal Observatory, and I found that the total error, after nearly 3000 miles of railway travelling and 750 miles by motor lorry across rough country frequently devoid of roads (after allowing for the known rate), did not exceed 10 seconds. I attributed this to the very great care we took of the chronometer and the regular windings at the same hour each day. The total error of 10 seconds was distributed evenly over the three weeks actually occupied in motor travelling, and the calculations were adjusted accordingly.

This expedition has its interest as an example of cheap ground control for a rough aerial survey with oblique photographs to fill in detail. Assuming that the Administration was in possession of the necessary instruments and the motor transport, and could provide the personnel, the expenses of this expedition amounted to practically nothing beyond the petrol and rations for the party, and as the petrol consumption was economical and the rations simple to the point of being Spartan, the cost of these two items could hardly have exceeded £50. The map shows that prominent features such as the north-east and south-east corners of the lake have been fixed, and along the eastern coast a prominent bay with an island (fixed by cross bearing from the shore) and the Simowana and Chuwana (Shuane on map) rivers are plotted in and could be readily identified, as owing to the dazzling white surface of the lake the shore-line and these features would show up plainly in an oblique photograph. On the west the course and bends of the Botletle could be fitted into the controlled sketch to supply detail. On the northern shore projections and re-entrants are controlled, and on the south shore the villages and the river could be adjusted to the mosaic by an experienced draughtsman.

During the journey between Rakops and Gominyan a duststorm raged which obscured the whole country and made it necessary to stop occasionally. Had it been possible to take one, a midday latitude would have been most useful to determine the extent of the southern bend of the river in this region. The road we followed appeared to wind about a great deal, but as compass bearings could not be taken we were unable to get even an approximate idea of our course. The windings of the river between Rakops and Gominyan have therefore been "faked" in and are unreliable, since the distance recorded by the speedometer was 57 miles, whereas the direct line between them only scales 38·3 miles. The boundaries of the lake, except where we established direct contact, are plotted in from rough estimates of distance where we could discern the shore, and elsewhere, as in the case of the western limits, from accounts from local inhabitants and other sources. As there are many outlying pans not obviously connected with the main body of the lake, it is possible that we may have shown some of these as the actual shore.

With regard to the suggested railway from Bulawayo to Walvis Bay our investigations and information accumulated in the past indicate that no great physical obstacles intervene, and that owing to the nature of the country construction costs would be exceptionally low. On the other hand, the country to be traversed is undeveloped and, at present, offers little profitable freight.

THE UNDERCUTTING OF CORAL REEF LIMESTONE ON THE COASTS OF SOME ISLANDS IN THE RED SEA

W. A. MACFADYEN

THE object of this note is to describe the undercut cliffs of coral reef limestone which form a striking feature of parts of the coasts of certain islands in the Red Sea, and which appear to be formed, not by wave action, but by a combination of solution of the limestone by sea-water and erosion by boring organisms. Since the old view of solution as a factor has been energetically combated in America in recent years, to the extent of a denial of its possibility, it is necessary to consider the case in some detail.

The coral reefs of the Red Sea have been studied by Ehrenberg,* who spent in all nearly twelve months there, and by Crossland and others, who dealt with more restricted areas of it. They are also considered by Darwin,† who had not personally visited them. None of these authors were, however, directly concerned with the aspect considered here. The facts described in the present paper are based on a fortnight's examination of the Ashrafi and Jubal Islands at the mouth of the Gulf of Suez in February 1925, and four months' work during the winter of 1926–1927 on the Farsan Islands and Kamaran Island in the south-eastern part of the Red Sea.

With the exception of a few (probably) basalt and sandy islands in the Farsan group, all the islands mentioned above consist almost entirely of raised Pleistocene reef limestone, and are fringed with growing corals. The Ashrafi Islands rise to a maximum of 30 feet above high-water mark, and are composed completely of coral reef. The Jubal, Farsan and Kamaran Islands are higher in places (the Farsan Islands reach a maximum of about 260 feet), and some exposures of the underlying Pliocene marls and marly limestones are found on many of them. The Pleistocene limestone, which forms most of the coasts of the islands, consists largely of shells and their casts, interstitial material (cemented calcareous sand), and corals.

Most of the islands project above a submerged reef limestone platform. The depth of water covering this at high tide varies from sometimes only a few inches near the shore up to some 6 feet at the growing edge, but is usually from 1 to 3 feet. The platform is often surprisingly even, and slopes very gently seawards; the outer edge is well defined, the depth of water increasing rapidly from 1 to 15 or 20 fathoms. The width of the platform is very variable, but is rarely less than 100 yards, and in places reaches 1000. Much of the platform is laid bare in exceptionally low water. It is often covered with a thin layer of mud, with various organisms; but pebbles and sand are rarely present.

For a considerable portion of their periphery, the islands are bounded by low marine erosion cliffs of raised reef limestone,‡ varying up to nearly the

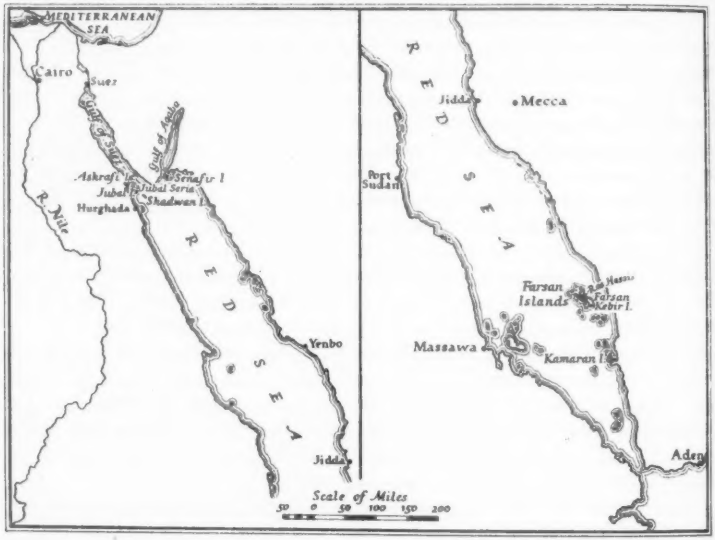
*C. G. Ehrenberg, *Abh. k. Ak. Wiss.* (Berlin, 1832 (1834)), pp. 381–438.

†C. Darwin, 'The Structure and Distribution of Coral Reefs' (London, 3rd ed., 1889), pp. 260–266.

‡The thickness of the reef limestone is 10 feet as measured in a cliff section at Bluff Point on Jubal Seria (where it rests on fossiliferous Pliocene); on the Ashrafi Islands, a boring through the reef limestone reached marly beds (probably Pliocene) at a depth of 55 feet below the surface, and 38 feet below high-water mark. The thickness in the

maximum height of the islands themselves, but often only from 3 to 10 feet high. These cliffs are usually undercut. In the Farsan and Kamaran Islands the relative raising of the beach has taken place in two or more clearly defined stages, with undercutting of the cliff at each pause between the uplifts. The last two levels at Ras Hassis in the Farsan Islands are 4·3 and 8·9 feet respectively above high-water mark.

At Ashrafi and Jubal the undercut is narrow (in the vertical sense), somewhat wedge-shaped in section, bounded above practically by high-tide mark, and extending to sometimes 2 feet below this, but often less. In the Farsan and Kamaran Islands the notch is much wider (Phot. 3, 4, 7 and 8) owing to the process having been interrupted by renewed raising of the beach, causing a



double undercut (Phot. 2). The undercut may reach a depth of 3 or 4 feet in from the face of the cliff, and considerably more in the case of stacks.

The reef limestone of the cliffs is undercut until the overhanging portion collapses of its own weight. Such fallen masses are not uncommon (Phot. 3); more often the beach is clear up to the shore-line, although the scars left by the falling of a mass may be visible in the cliff (Phot. 7), and bear witness to the different rates of sub-aerial and marine erosion in these islands. The undercutting is frequently best developed in the most sheltered parts of the cliff, occasionally where a portion of the platform is virtually landlocked (Phot. 1, 2); on less sheltered coasts it is not well seen.

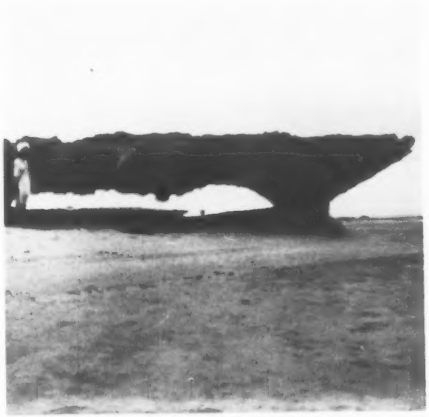
Farsan and Kamaran Islands has not been clearly observed, but it is of a similar order. These observations are in harmony with those of J. Walther on the west coast of Sinai (*Abh. math.-phys. Kl. k. sächs. Ges. d. Wiss.*, Leipzig, vol. xiv, No. x, 1888), and with those of T. Barron and W. F. Hume, on the coast of the Eastern Desert of Egypt ('Topography and Geology of the Eastern Desert of Egypt, Central Portion,' 8vo (Cairo, 1902), p. 147).

1. Boat-shaped undercut rocks, Khella, Farsan Is.

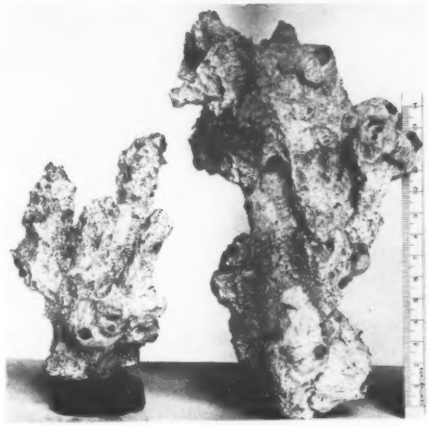
2. Double-undercut rocks, Khella, Farsan Is.

3. Undercut cliff and rock from south; east coast of Kamaran I.

4. Undercut cliff from west



5. Undercut cliff, raised above high-water mark: Osman Ramis I., Kamaran I.



6. Pinnacles of eroded coral limestone, Jubal Seria I.

7. Undevcut islet from south: east coast of Kamaran I.

8. Undercut islet from north-west .

The surface of the rock (Phot. 6) is often blackish in colour—probably owing partly to residual impurities, partly to organic growths—with jagged irregular pits separated by knife-edges, and vertical pinnacles, as has been described by Ehrenberg.* Occasionally abundant cirripedes live on these surfaces, the limestone to which they adhere being in some cases partially dissolved away round their base, leaving them perched on slight eminences, and partly undermined. The adherent barnacles, kindly determined for me by Mr. T. H. Withers, of the British Museum (Natural History), are *Tetraclita squamosa rufotincta* Pilsbry (well shown in Phot. 6), *Chthamalus stellatus* Poli, and the boring species *Lithotrya valentiana* Gray.

Some of the older raised reefs of the area are dolomitized;† to determine whether or not the newer reef limestone were similarly affected, the following analyses‡ of rocks from Ras Hassis, Farsan Kebir Island, were made:

	Specimen A.	*Specimen* B.	*Specimen* B
Silica	0·60	0·80	1·05
Iron oxide	0·16	0·15	0·17
Alumina	0·79	0·75	0·99
Calcium oxide§	53·78	52·67	52·50
Magnesium oxide	1·01	1·60	1·30
Carbon dioxide	42·54	41·92	41·70
Sodium chloride	0·23	0·61	0·76
Sulphuric acid (SO_3)	trace	trace	trace
Combined water (by difference)	0·89	1·50	1·53
	100·00	100·00	100·00

Specimen A: limestone, with few shells and many casts, much interstitial material (cemented calcareous sand, etc.), but no obvious corals; collected from the top of the cliff, about 12 feet above high-water mark—the highest part of the raised beach at that point.

Specimen B: limestone, with shells planed off flat at surface, with shells, casts and interstitial material, no obvious coral; from within 1 inch of the surface of the lowest or 4·3-foot raised beach platform.

Specimen C: limestone, mainly of interstitial material, with a badly preserved bryozoan, a few shells and casts; from within 1 inch of the surface of the present-day reef platform, below high-water mark.

*C. G. Ehrenberg, *op. cit.*, p. 415.

†J. Walther (*op. cit.*) gives an analysis of a reef at Jebel Hammam Musa, near Tor, Sinai, at a level of 230 metres (=755 feet) above sea-level. This shows 6·88 per cent. silica, and 32 per cent. magnesium carbonate. A large *Tridacna* shell from the same locality yielded about 42 per cent. magnesium carbonate.

J. Felix (1904, *Zeit. deutsch. geol. Ges.*, vol. lvi, p. 168) gives an analysis of a coral, *Orbicella lyonsi* Felix, from raised reef which he considers to be of older Pleistocene age from "Wedge Hill" (Jebel Gharamul, in the Eastern Desert of Egypt); this contained 41·52 per cent. magnesium carbonate. Unless there is some confusion in the locality, however, the present writer, who has mapped that district in detail, considers the age of that reef to be probably Miocene, as is, indeed, shown on T. Barron and W. F. Hume's geological map (*op. cit.*, pl. II).

‡These were kindly made for me by Dr. H. E. Cox, M.SC., PH.D. (LOND.), F.I.C., Public Analyst for the Borough of Hampstead.

§Corresponding to calcium carbonate 96·03 per cent.; 94·06 per cent.; 93·76 per cent.

7. *Undercut islet from south: east coast of Kamaran I.* 8. *Undercut islet from north-west.*

Differences in the analyses are slight, and dolomitization quite inappreciable. Silica increases consistently from Specimen A to Specimen C, and calcium carbonate decreases slightly but consistently. These three specimens come from different parts of a probably continuously formed reef, Specimen C from the earliest formed portion, which has been submerged for the greatest length of time, and Specimen A from the latest formed portion, raised above the water-level shortly after its formation and still remaining above it. The variation in silica and calcium carbonate content may therefore be explained on the hypothesis that submergence causes leaching out of the calcium carbonate, at least at the surface of the rock.

The tides in the landlocked Red Sea are very small, and probably average less than 2 feet at the mouth of the Gulf of Suez. According to the 'Red Sea Pilot'* the tidal rise at Ashrafi is only $1\frac{3}{4}$ feet; but in that work several other factors which influence the water-level are discussed, and occasionally (as seen by the writer, once at Ashrafi, and on several occasions at Hurghada on the coast of Egypt, 50 miles to the south) these may act together to mask the tidal factor, giving exceptionally high or low water sometimes continuously for several days.†

'The Red Sea Pilot' records a series of observations made at Shadwan Lighthouse (26 miles south-east of Ashrafi and 19 miles south-east of Jubal Seria). Winds from north-west and north preponderate overwhelmingly, and are recorded to blow for 298 days in the year, often strongly for days on end; the seas they raise are considerable. In the Farsan Islands the prevailing winds are from the south. On several days the writer observed at Ashrafi and Jubal the effects of a rather rough sea due to a strong northerly breeze. The waves spent almost all their force on the outer edge of the reef, where there was a constant line of foam; at the shore-line, even on the windward side of the islands, there arrived mere wavelets which produced no more action than a little uneasy splashing under the influence of the driving wind. On the north-west side of the most westerly Ashrafi Island and on the north of Jubal Seria occur miniature bays where cinders thrown overboard from passing ships have been cast up less than 2 feet above the normal high-water mark.

The annual rainfall at the mouth of the Gulf of Suez probably averages less than 1 inch, and normally falls during either one or two days in the winter. In the Farsans the rainfall is very low (though appreciably greater than in the north), and unevenly distributed; according to native information some villages had had no rain for four years, but the writer was caught in local but drenching rainstorms on two occasions.

In the shallow water covering the reef platforms round the Red Sea coasts, changes of temperature are strikingly marked; unfortunately only relative differences were, in most cases, noted by the writer. In the early mornings, especially in winter, when the deeper water surrounding the Farsan Islands was at 81° F., the shallow water of the reef platform was frequently unpleasantly cold to the feel; whilst in the afternoon, specially in summer, when the deeper water was relatively cool to the body, the reef platform water might

*'Red Sea and Gulf of Aden Pilot,' 7th ed. (1921), p. 30.
†Cf. C. Crossland, *J. Linn. Soc.* (*Zool.*), vol. xxxi, 1907, p. 16.

be considerably too hot for comfort on emerging from the deeper water after bathing (observed in the Gulf of Suez area).

To the very small range of the tides is probably due in no small degree the fact that the undercutting is so well marked; the process, however caused, being concentrated on the rocks between high and low water.

That the usually well-developed reef platform must protect the cliffs from erosion by wave action is borne out by the observations of the writer at Ashrafi and Jubal described above; and the presence of cinders thrown up to a distance of less than 2 feet above high-water mark testifies to the feeble force of the waves at the cliff even during storms. There is a marked general absence of pebbles and sand on the beaches, and wave action is therefore very largely bereft of its weapons of attack.

The above inferences are, of course, in themselves not conclusive, but the fact that the undercut is best developed on the most sheltered parts of the coast, sometimes on portions which are virtually landlocked, is the exact opposite to what would be expected to occur if wave erosion were the dominant factor, and is therefore strong evidence against that hypothesis.

The sharpened and roughened surface of the undercut and the protection of the surface by adherent barnacles, is strongly in favour of the solution theory. Wave action has in detail a rounding and smoothing effect on outstanding limestone rocks. On the undercut cliffs of the Red Sea the barnacles are often on miniature pedestals, showing that their erosive power is less than that of the sea-water. It is difficult to understand how wave action could remove the limestone round the barnacles without removing the barnacles also. On many coasts where solution effects might be expected, they must be almost entirely masked by wave action; this is such a well-known, often obvious, and always convenient explanation, that it is only in cases such as those described above, where wave action is at a minimum, that solution effects are unmistakable. Similar undercut reef limestone cliffs are figured, for instance, from an islet on the north of Senafir Island at the mouth of the Gulf of Aqaba,* from Zanzibar,† and from Fiji and the Philippine Islands; many photographs of other coral limestone coasts might also be quoted.‡ It is suggested that such coasts would repay examination for light on the theory of solution of limestone by sea-water.

In the destruction of reef limestones the role of boring organisms at the shore-line has long been recognized as of great importance. These organisms include algae, molluscs, sea-urchins, barnacles, and particularly Polychaete worms and small sponges.§ This problem has not been studied on the spot by the writer, but previous workers who describe the organisms are unanimous

*K. Natterer, *Denk. k.k. Ak. Wiss. Wien*, vol. lxv, 1898, pl. x,

†C. Crossland, 'Desert and Water Gardens of the Red Sea,' 8vo (Cambridge, 1913), pls. xxxii, xxxv.

‡W. M. Davis, *Amer. Geog. Soc.*, Special Pub. No. 9, 1928, Figs. 12, 13, 14.

§L. Agassiz, 'Ann. Rep. of the Superintendent of the Coast Survey . . . for 1851' (Washington, 1852), Appendix 10, p. 154; J. A. Dana, 'Corals and Coral Islands,' 8vo (London, 1875), p. 95; A. Agassiz, *Mem. Mus. Comp. Zool. Harvard*, vol. xxviii, 1903, p. xxiii (Introduction); J. Stanley Gardiner, 'The Fauna and Geography of the Maldive and Laccadive Archipelagos,' vol. i, 1903, Part 3, pp. 335, 336; A. G. Mayor, 'Papers from the Dept. of Marine Biology of the Carnegie Inst., Washington,' vol. ix, 1918.

on the enormous numbers in which they occur round coral reefs, *e.g.* in Florida, the Indian and Pacific Oceans, and the great destruction of the reefs that they cause. There seems no doubt that, as similar organisms occur, they cause as great destruction in the Red Sea as elsewhere. The possibility of the undercutting being caused in part by current action has been borne in mind, but no evidence of this has been observed, and this explanation, by itself, is clearly out of the question.

The theory of solution of coral-reef limestone by sea-water to account for certain features of coral reefs was, according to A. Agassiz,* originally put forward by Karl Semper.† It was, however, first seriously discussed with experimental evidence by Murray.‡ The writer has unfortunately been unable to make a complete search of the writings of A. Agassiz (who is often stated to have elaborated the theory) for a discussion of the problem, but in several of his papers there is a definite acceptance of the theory,§ as there is in the case of a number of other authors‖ whose opinions carry considerable weight.

Certain American work of the last couple of decades has, however, given rise to statements that the solution theory is definitely an incorrect assumption, which has now been conclusively disproved.¶ This view, one may venture to think, is due in part to certain erroneous inferences from other work which deals specifically with the solubility of calcite in sea-water,** and the overlooking of the undoubted presence of other less stable and more readily soluble forms of calcium carbonate.

Again, R. T. Chamberlin (*op. cit.*, p. 169) quotes Mayor in a conclusion no one will dispute: "The surface waters . . . being alkaline cannot dissolve limestone *by reason of their acidity*" (present writer's italics). This self-evident truth, however, seems to be the type of basis for the unwarranted generalization on p. 168: "The Murray–Agassiz theory of solution is dependent on the ability of sea-water to dissolve calcium carbonate under the conditions existing in tropical seas, but various investigators have recently shown conclusively that the alkaline water of the tropical seas is unable to do this."

Another point is in need of a clear understanding. In some of Mayor's experiments (*loc. cit.*, 1918) loss of weight in his specimens of limestone left exposed on a coral reef is claimed to be due entirely to boring organisms. Although no one will deny that this is in part correct, there is no shred of proof that it is entirely the case, yet the paper is used as evidence against the solution theory. Attention may be directed, on the contrary, to earlier work

*A. Agassiz, *Mem. Mus. Comp. Zool. Harvard*, vol. xxviii, 1903, p. xiii.

†K. Semper, 'Die Palau-Inseln im Stillen Ocean,' 8vo (Leipzig, 1873).

‡J. Murray and R. Irvine, *Proc. Roy. Soc. Edin.*, vol. xvii, 1889 (1891), pp. 79–109.

§*E.g.* A. Agassiz, *Proc. Roy. Soc.*, vol. lxxi, 1903, p. 413; and *Mem. Mus. Comp. Zool. Harvard*, vol. xxviii, 1903, p. xxiii (Introduction).

‖*E.g.* 'The Atoll of Funafuti' (London, 1904): W. J. Sollas, pp. 13, 17, 21; T. W. Edgeworth David and G. Sweet, p. 71; J. W. Judd, p. 383, etc.
J. Stanley Gardiner, *op. cit.*, vol. i, pp. 322, 334.

¶*E.g.* T. W. Vaughan, *J. Wash. Ac. Sci.*, vol. iv, 1914; A. G. Mayor, 'Papers from the Dept. of Marine Biology of the Carnegie Inst., Washington,' vol. ix, 1918, and vol. xix, 1924, p. 28; R. T. Chamberlin, *Ibid.*, vol. xix, 1924, p. 168.

**E.g. J. Johnston and E. D. Williamson, *Journ. Geol.*, vol. xxiv, 1916, p. 729; R. C. Wells, 'Papers from the Dept. Mar. Biol., Carnegie Inst.,' vol. ix, 1918, p. 316.

which leads to the conclusion, in the writer's opinion, that solution of limestones by sea-water, even round coral reefs, is by no means impossible or improbable.

Different forms of calcium carbonate are dissolved to a different extent in sea-water, from coral sand—0·032 gm./litre upwards—to freshly precipitated "amorphous" calcium carbonate—0·649 gm./litre.* The existence of such a form as "amorphous" calcium carbonate has been queried,† but in any case different corals are soluble to varying extent in sea-water, depending on the species; the more "amorphous" and porous the species the greater the solubility, one series of experiments giving figures varying from 0·0453 to 0·1860 gm./sq. in./year.‡

Coral-reef limestone is composed in part of calcite, in part of aragonite, both as regards the original tests of organisms§ and secondary infillings.‖

The extent of the solvent action of sea-water in some cases is shown by the removal of carbonate of lime shells of surface organisms from all the greater depths of the oceans.¶ It is also indicated by the fifty-fold excess of silica in the mud of Suvadiva lagoon over the proportion found in the surface rock.**

It appears to be assumed in much of the recent American work referred to above that the solubility of calcium carbonate in sea-water can be due only to the agency of carbonic acid, but this has long been recognized not to be the case. From all the evidence of the *Challenger* research, free carbonic acid in sea-water is the exception. As a rule the carbonic acid in sea-water is less than the proportion corresponding to bicarbonate.†† Even alkaline sea-water, if given sufficient time, will take up calcium carbonate in addition to what it already contains.‡‡ This last statement is confirmed by W. S. Anderson,§§ who goes so far as to state that the behaviour of a solution of calcium carbonate in sea-water on standing in a closed vessel where it is impossible carbon dioxide could escape, and the subsequent throwing out of solution of the major portion of the calcium carbonate, seems to prove beyond question that its solubility has nothing to do with the existence of free carbonic acid or bicarbonate. From the work quoted above, therefore, it would seem to be established that alkaline sea-water can dissolve calcium carbonate, and that other forms go into solution much more easily than calcite, which is the most stable modification.

The very large number of analyses of sea-water from all parts of the ocean show that ocean water is remarkably constant in percentage composition of all the usually estimated ions; lime and carbon dioxide, however, vary over a slightly, but probably significantly, greater range than the other ions with the

*R. Irvine and G. Young, *Proc. Roy. Soc. Edin.*, vol. xv, 1888, p. 316.

†*E.g.* J. Johnston and E. D. Williamson, *Journ. Geol.*, vol. xxiv, 1916, p. 728.

‡J. Murray and R. Irvine, *Proc. Roy. Soc. Edin.*, vol. xvii, 1889, p. 109.

§W. Meigen, *Centralbl. f. Min. Geol. und Pal.*, 1901, p. 577, whose results have been confirmed by E. W. Skeats, *Bull. Mus. Comp. Zool. Harvard*, vol. xlii, 1903, p. 66.

‖C. G. Cullis, 'The Atoll of Funafuti,' 1904, pp. 392–419, pl. F; E. W. Skeats, *op. cit.*, p. 101, etc., and *Amer. Journ. Sci.* [4], vol. xlv, No. 266, 1918, p. 89.

¶J. Murray, *Proc. Roy. Soc. Edin.*, vol. x., 1879–1880, p. 517.

**J. Stanley Gardiner, 'The Fauna and Geography of the Maldive and Laccadive Archipelagos,' vol. i (1903), Part 3, p. 322.

††W. Dittmar, '*Challenger* Rep.: Physics and Chemistry,' vol. i, 1884, p. 220.

‡‡W. Dittmar, *op. cit.*, p. 222.

§§W. S. Anderson, *Proc. Roy. Soc. Edin.*, vol. xvi, 1889, pp. 319 *et seq.*

exception of chlorine and probably sodium.* Although contrary to Dittmar's belief it seems to have been shown, also, that the surface layers of sea-water are saturated or supersaturated with respect to calcium carbonate.† It is a little curious that such results, coupled with the insistence on the fact that calcium carbonate is being abstracted from sea-water in large quantities by the host of marine organisms secreting calcareous tests, and possibly by other means also, has not led others back to Murray and Irvine's view (*op. cit.*, p. 99), that "It is evident that a very large quantity of calcium carbonate is in a continuous state of flux in the ocean, now existing in the form of shells and corals, but after the death of the animals passing slowly into solution to go again through the same cycle." It is patent that precipitation of carbonate of lime cannot be continued indefinitely without either reducing the quantity in solution or admitting a constant source of replenishment; but while precipitation is constantly referred to in the literature, the writer has not observed similar stress being laid on any adequate process for restoring the concentration of dissolved calcium carbonate. A minor and admittedly inadequate process, mentioned by Mayor (*op. cit.*, 1918), is that of calcareous sand-eating holothurians, which dissolve a certain amount of lime during their digestive processes. The inflow of lime-bearing river-water partially to adjust the balance, as suggested by Clarke,‡ is especially inadequate in the case of the Red Sea, which has, to all intents and purposes, no permanent streams flowing into it.

Temperature is probably one of the main conditions controlling the tendency of calcium carbonate to go into or remain in solution in sea-water.§ This probably operates in part at least through the increased proportion of carbonic acid in colder water,‖ since, though it has been shown that carbonic acid is not an essential, it is undoubtedly of great assistance. The temperature conditions round the islands in the Red Sea have been discussed above.

An endeavour has been made above to reach a conclusion from existing literature, and experiments on the subject whether solution of limestone in the surface waters of tropical seas actually takes place or not. The conditions of the problem are so complex, that a final positive answer does not seem at present possible, but in the writer's opinion, the evidence summarized above does point clearly to solution taking place. In conclusion, therefore, it is suggested that the undercutting of raised reef limestone of the Red Sea islands described and illustrated above is, in fact, due to a combination of solution by the sea-water and destruction by boring organisms. With the evidence at present available it is not possible to state which is the more important.

I have to thank Prof. J. Stanley Gardiner, F.R.S., Dr. C. Crossland, Mr. A. G. Brighton, and Mr. Maurice Black for valuable criticism during the preparation of this paper.

*W. Dittmar, *op. cit.*, p. 23, table I.

†E. Cohen and H. Raken, *K. Ak. Wettensch. Amsterdam, Proc. Sec. Sci.*, vol. iii, 1901, p. 63; J. Johnston and E. D. Williamson, *loc. cit.*; J. F. McClendon, *Proc. Nat. Ac. Sci.*, vol. iii, 1917, p. 618; L. Irvine, *Jour. Marine Biol. Assoc.*, vol. xiv, 1926, p. 441.

‡F. W. Clarke, 'Data of Geochemistry,' 5th ed., U.S.G.S. Bull. 770, 1924, p. 132.

§Cf. R. C. Wells, 'Papers from the Dept. of Mar. Biol., Carnegie Inst.,' vol. iv, 1918, p. 316; F. W. Clarke, *op. cit.*, p. 131.

‖W. Dittmar, *op. cit.*, p. 220.

HIMALAYAN RANGE NAMES

THE Editor has pleasure in publishing a group of contributions to the discussion begun in the *Journal* for September last, and will be glad to receive the opinions of other geographers who know the Karakoram, preparatory to a conference on the subject which will, it is hoped, take place early in the coming summer.

The letters from Sir Sidney Burrard discuss two passages of the Editorial Note, and in particular the sentence "These ideas of Godwin Austen dominated the Survey of India for the next forty years" (*G.J.*, 74, 1929, 276).

Major Mason's note is in reply to Sir Sidney Burrard's "Defence of the existing Nomenclature," in the same number of the *Journal;* and Dr. Longstaff's comments were written on receipt of an advance copy of this note.

The Editor has received several letters on the subject which he may be allowed to summarize thus:

Lt.-Colonel Philip Neame, V.C., D.S.O., is strongly in favour of the names used hitherto by the Survey of India, and against the proposed changes, on the ground that the name of the Karakoram Pass is one of the few geographical names known almost universally to the inhabitants of all this mountain region. He would therefore retain the old, historical, and well-known name of Karakoram alone, to be applied to both the mountain region and the Main Range.

Mr. H. S. Montgomerie writes that he is in agreement with Sir Sidney Burrard's article, and maintains that the earlier surveyors described K_2 as essentially a rock peak with bare black surfaces too steep for the snow to lie, as against Major Mason's description, from a different aspect, as "spotlessly white" and the range as the whitest and iciest outside the polar regions. On the early use of the name he quotes from a private letter written by his father, Colonel T. S. Montgomerie, on 22 September 1856: "I took a run into Thibet and have seen the mountains of the Karakorum range that separate the valley of the Indus from Yarkand and those places."

Sir Martin Conway, on the other hand, writes that the Karakoram range "has nothing to do with the pass of that name, still less with the ancient capital of the Mongols. Muztagh is a better name for the K_2 range: but what will you call the range north of the Hispar and that south of the Baltoro?"

THE HIMALAYAN RANGES AND GODWIN AUSTEN'S MAP

Extracts from letters written by Sir Sidney Burrard to the Editor G.J.

From letter of 27 September 1929

There were one or two points in your article on the Indian Border, *G.J.*, September, p. 274, which were not quite fair to the Survey of India.

You are quite mistaken in thinking that the ideas of Godwin Austen have dominated the survey for fifty years or that our maps are dependent on geology. I have never seen that map in any Indian drawing-office, I have never heard it

quoted, and have never used it myself. The reason that the successive maps of Tibet from Walker's downwards all resemble one another is that they are all based on the same topographical data, the later maps having additional data. All our maps of Tibet are purely topographical; geology does not enter; there have been no geological surveys, and if there had been, we never use geology in topographical maps.

In all branches of knowledge generalization is necessary and difficult. Geographers are obliged to generalize, and to produce diagrammatic maps of complicated mountain systems. These diagrams are required as index maps, and for bird's-eye views. If we plot all the known peaks above 16,000 feet, the points on our charts arrange themselves in curvilinear alignments. I am no advocate of "ranges"; as a geologist Hayden was opposed to long ranges, because the eastern part of the Himalayan range was of a different age from the western. But Hayden, like myself, could not but see that the high points of Tibet insisted on grouping themselves in curvilinear arrangements, and a "range" is merely an abbreviation for curvilinear arrangement.

We have to keep quite separate the question of the continuity of ranges from east to west, and the continuity of their names throughout their lengths. As to the continuity of ranges the topographical data lead to the idea that the plateau of Tibet is traversed from west to east by long continuous ranges. If a range does sink into the plateau here and there, it seems to reappear on the same alignment a little farther on. Between the ranges the plateau seems to consist of level strips. There has been no topographical survey; but there have been scattered surveys form east to west and from north to south, and they all confirm the view of parallel ranges.

As to continuity of names across the plateau, every one would like to find Tibetan names. No one wants to extend the name Karakoram east of the Karakoram region: it would be a mistake. The *Map of Tibet*, 1914, which you quote, had a very unfortunate error, which was not noticed by the scrutineer; the drawing-office was short-handed, and this mistake crept in. The draughtsman entered the name Karakoram too far east. This was a mere slip; there was nothing intentional about it. I have never heard any surveyor advocate the extension of the name Karakoram east of the Shyok basin. The name has not been limited in area with the same definite precision as a state boundary. But just as the name of this range is automatically changed to Hindu Kush, as it proceeds westwards into Afghanistan, so we may hope that it will one day take on a Tibetan name as it proceeds eastwards.

With regard to your remark about the Ladakh and Kailas ranges extending eastwards to 92°, there is no doubt that these two ranges are very long alignments of elevated points. The apparent breaks in their continuity are mentioned on pp. 93 and 95, Part II (Burrard and Hayden's sketch). These breaks are probably only dips of the alignment below the high level of the plateau. The difficulties of naming these long ranges, when there are no Tibetan names, were painfully present to Hayden and myself in 1907. Our critics may say, "How absurd to extend the names Ladakh and Kailas through so many degrees of longitude!" The names affixed to these two ranges were given in 1852–53 by Cunningham, a careful, scientific and erudite explorer; we followed Cunningham, and in the absence of Tibetan names we continued

Cunningham's names throughout the eastern prolongations of his range-alignments. In taking this step and in avoiding inventions of new names, we were only actuated by the wish to leave the whole question open for final consideration when the time had become ripe. We thus saved our successors from the complications of having new names started which might prove unsuitable. I may say that in 1907 we consulted every known authority about these ranges, and we received the universal advice: "the time is not ripe; leave the question alone."

The ranges of Tibet seem to open like a fan, and to be squeezed together at the north-western end. But the same elevated alignments seem to persist even when squeezed and pushed north-west.

From letter of 5 October 1929

Thank you very much for sending me Godwin Austen's papers and map. They are forty-six years old, and though they may have marked a step of progress in 1883, they are now out of date, owing to the explorations in recent times of Ryder, Wood, Kishen Singh, and others. When Godwin Austen wrote these papers he had been absent for twenty years from North-Western Tibet, and had become engrossed in the geology of the Eastern Himalayas in Assam. As you kindly invite me to make further remarks upon your paper, I gladly accept.

You say on p. 276 that the geological structure is indicated by long lines in red overprinted on the map. But these lines of red are not geology: they are merely lines of high elevation. Some of these lines are borrowed from Markham and Saunders, who were not geologists. Godwin Austen himself calls these lines "elevation lines." Although he tries in his letterpress to find a relationship between these lines and the known geology, a modern geologist would, I am sure, say he was premature, as so little geology was known. In the sentence you mention on his page 611, he is only referring to the main Himalayan mass, south of Tibet. The geologists had learnt something in 1883 of the Himalayas, but after years of association with Hayden and Holland and Oldham and Middlemiss, I feel sure that they would have repudiated any assumption of a knowledge of geology in Tibet.

On p. 277 you say that the Karakoram range has been carried away east of Mount Everest because geologists identify rocks. The geologists have never explored the Karakoram and its extensions in Tibet; and geographers would never continue a name on geological grounds only. Except for one map, upon which the name Karakoram was misplaced by a draughtsman's slip, this name has never been extended into Tibet.

In Hayden's and my 'Sketch of Himalayan Geography' we drew the ranges by plotting all the high peaks (please see Chart V of Part I, on which all peaks higher than 24,000 feet were plotted). We continued this process down to 19,000 and 18,000 feet. In Tibet, where heights had not been observed, we had to rely upon the reports of explorers concerning the perpetual snow upon peaks.

It is true that the Ladakh range is a long one. The evidence of its length is discussed in Part II, pp. 92, 93, of 'Himalayan Geography.' We stuck to the name Ladakh because it was the only name that had been used by our predecessors, and we disliked inventing new names.

THE PROPOSED NOMENCLATURE OF THE KARAKORAM-HIMALAYA

MAJOR KENNETH MASON, M.C., R.E., Survey of India

SIR SIDNEY BURRARD has written a defence of the existing nomenclature of the Mountains of the Karakoram. I quite agree that it served its purpose in 1880, when little was known of the geography, though I maintain that *Muztagh* would even then have been better than *Karakoram* for the main range. As my report and suggestions have been quoted by Sir Sidney, I feel it desirable to explain in some detail my proposals. His 'Sketch of the Geography and Geology of the Himalayan Mountains and Tibet' has always been my Bible; but it was written over twenty years ago, and it must be to some extent out of date to-day, since our knowledge of the Himalaya has advanced. In it he first sorted order out of chaos, where there were sufficient data to go upon. I have read it over and over again, and in a humble way have tried to carry out his ideas.

My main contention now is that *Karakoram* is definitely unsuitable for the alignment as shown on our pre-war maps, that *Karakoram* has been used far more for the region than for the range, and that it is now definitely inconvenient to use it for both. Sir Sidney says in his Geography: "Colonel Montgomerie . . . named the whole Karakoram region K and its peaks K_1, K_2, K_3," etc. Wood describes his explorations on the Depsang and by the Karakoram pass as in *the Eastern Karakoram;* De Filippi uses 'Karakoram and Western Himalaya' for the title of his book on the Duke of the Abruzzi's explorations in the Baltoro area; for an area between these two, the Workmans use the term *Western Karakoram;* the Vissers include the glaciers west of the Hunza river among their *Karakoram* glaciers. Sir Sidney Burrard himself says: "Are there two Karakoram ranges parallel to one another? . . . No second Karakoram range has been shown upon the frontispiece to Part I; its existence as a separate crustal fold is conjectural. . . . Even the great Karakoram peaks themselves seem to follow two alignments. . . . Of the Karakoram peaks north-east of K_2 we have no knowledge." That was in 1906.

I maintain that the whole area has been called *Karakoram* or *Karakoram-Himalaya*. Burrard hinted at other Karakoram alignments both to the south and to the north of the range of the great peaks. It is Longstaff who says that the southern range, called by Burrard *the Kailas*, is more akin to the main Karakoram range than to the Kailas mountain many miles away to the south-east (*G.J.*, vol. 69, 1927, p. 329). He confirms Burrard's suggestion, and says: "Yes: there is a second alignment of Karakoram peaks south of the northern one." I have merely filled in Burrard's admitted blank in our knowledge about the Karakoram peaks north-east of K_2. Do these not lie on the Aghil–Karakoram range?

Sir Martin Conway's map of the Hispar, Biafo, and Baltoro glaciers, published by the Society in 1894, was headed "The Karakoram Himalayas." A. C. Ferber in the *Geographical Journal*, December 1907, described his "Explorations of the Muztagh pass in the Karakoram Himalayas." The title of Sir F. De Filippi's lecture to the Royal Geographical Society on 21 November 1910 was "The Expedition of H.R.H. the Duke of the Abruzzi to the Karakoram Himalayas."

The title to my own map in the *Geographical Journal*, vol. 69, is "Karakoram Himalaya." Here is a tradition extending over forty years.

It is Sir Sidney Burrard who emphasizes the geological aspect, for what is primary structure but geology? And what does he mean when he says in his Geography: "until geologists prove our assumptions to be wrong"? (see also *op. cit.*, p. 71). I contend that geographically there are a series of ranges more or less parallel to each other and in a definite geographical regional block, geographical in the sense that an island or a country is a geographical feature. The southern range is unconnected either geographically or geologically with the Kailas. For this regional block, a large part of which has been known rather vaguely as *Karakoram* or *Karakoram-Himalayas* for a number of years, I propose the name *Karakoram-Himalaya*. Many people consider the whole series of ranges of Northern India, and between the Indian plains on the one hand and Tibet or China on the other, as the *Himalaya*, and look on the Karakoram as part of the Himalayan ranges. Is it so much more incongruous to show the source of the Yarkand river in a Himalayan region than to show the source of the Indus in a Tibetan one, or the Hindu Kailas across Buddhist Ladakh or Muhammadan Baltistan? Burrard says it is distressing to see a Sanskrit name applied to a Mongol region. We have become used to the name in Southern Tibet, which is inhabited by Mongolians, while the area where I propose to use it is uninhabited by any one.

I do not think Sir Sidney quarrels with my proposed alignment of the Muztagh-Karakoram. On the frontispiece to Part I of his Geography, he shows the alignment as I propose, having drawn it by joining up the summits of the ice mountains; and here it does not go through the Karakoram pass. It is only on the old maps themselves (through the misapprehension of Moorcroft in the first instance) that the name Karakoram has been bent away along the watershed to the Karakoram pass from the range through the Saser pass; or perhaps it would be more correct to say: The name Karakoram has been bent from the watershed at the Karakoram pass on to the range of the great peaks. In his book Burrard stresses over and over again that a range is not necessarily a watershed, and that the great peaks of the Himalaya do not lie on spurs from the main watershed range. Nor do the great Saser peaks lie on a spur of the insignificant watershed west of the Karakoram pass. The Karakoram pass cannot be considered as the "entrance door" from Yarkand into the Karakoram region as suggested by Sir Sidney Burrard. Hayward was given the name *Karakoram* north of this, not south. The Karakoram pass is excessively easy and essentially an "inside door," rarely closed. If there is an outside door, it is on the Kun Lun on the north, and at the Saser pass on the south. These are the two doors to the true "black," angry, windy, desolate, devil-inhabited region, littered with dead bones.

I used the translation of Karakoram, *Black gravel*, that Sir Sidney Burrard gave in his book, and it is the one generally accepted. Colonel Wood says that *Koram* means a *boulder* or *rock*. I have also been told that the word can mean *boulders* or *scree*. But the actual meaning does not amount to much. "Black ground covered by large blocks of stone fallen from mountains" is surely hardly more appropriate than "Black Gravel" for "the whitest, iciest range of mountains outside Polar regions." It is however suitable for the whole region,

for on both sides of the central ice mountains, the ranges of the Aghil-Karakoram and the Kailas-Karakoram are continually bombarding the valleys with rock.

The theory that *Kara*, "black," may be appropriate as an epithet for an "angry white" mountain is ingenious. But the Turki and the Ladakhi are more material than that. The Sa-Ser is Yellow Ground which is in the Shyok valley; the Kadpa-ngonpo La is the Blue Drift pass, and close to it is a blue scar on the hillside. The Dizma La is the Many-coloured pass because of the variegated

Diagram of proposed range-names in the Karakoram, reproduced with addition of a few pass and glacier names from the original diagram G.J., Sept. 1929, p. 275.

rocks, and the Marpo La is the Red pass because of the red rocks of the Aghil. These names were given us by our men. Aq-su is *white water* from *white snow*. The Muztagh is the abode of divinities, and divinities are white. The ancestor of the Mir of Hunza married a divinity of the peak, Dumani, the Mother of Mist. Nanda Devi and Nanga Parbat are goddesses, not evil spirits. Devils are black, and they live in forests, and deserts, and seas, and oceans.

I base my desire for a revision of the nomenclature on the ineffectiveness, inconvenience, and inaccuracy of the old. I do not suggest that the word Karakoram, which has so many traditions, should be abolished, but rather extended to include the whole area of mountains which all the great travellers of the past have called by that name. Longstaff suggested either the Karakoram, the Karakorams, or the Karakoram-Himalaya for this mountain complex (*G.J.*, vol. 69, p. 330). I have suggested the last, as this seems to me distinctive. It would still include the line of the great peaks. Muztagh, too, has its traditions, and under my proposals, would come back into its own, instead of being banned to obscurity as it was in 1880. The main range would become the Muztagh-Karakoram; it would still be the main Karakoram range, but not the Central Asian watershed. The combination of the two words prevents it being confused with other Muztaghs or other Karakorams which are also numerous; the combination of the two names is unique.

I have said that Muztagh has its own traditions. It was used by Henry Strachey in his 'Physical Geography of Western Tibet'; he saw the distant mountains from the south in 1848. It was shown on the planetable of Godwin Austen in 1861; he first surveyed the range from the south. Hayward, on the north, was given the name for the ice mountains to the south, Sir Francis Younghusband, who first *saw* the range from the north, called it the *Muztagh Mountains*. I have heard the name used in Hunza for the ice mountains to the east, though Turki is not the native tongue of Hunza. The traders of the Karakoram pass have spoken to me of the ice mountains to the west as the Muztagh. Is this not sufficient tradition to sanction its use ?

If we look on the southern range and the northern range as in the Karakoram region, why should we not call them the Kailas-Karakoram, and the Aghil-Karakoram ? With the Kailas range, some such distinction seems necessary. If we mean this southern alignment, and merely call it the Kailas range, we have a vision of the range near the sacred mountain of Kailas, disconnected and far away to the south-east. There is another Kailas, a well-known mountain opposite Chini on the Sutlej, some miles north-east of Simla. This is on the Great Himalaya range, and to distinguish it from the one in Kumaun, it is called either the Lesser Kailas, or more generally the Kanawar Kailas. I have not invented this. To denote the Kailas range of the Karakoram region, is it not natural to call it the Karakoram-Kailas or the Kailas-Karakoram ? Sir Sidney Burrard himself uses regional names for the Great Himalaya. He refers to the Punjab Himalaya; he means the Great Himalaya in the Punjab. He writes of the Nepal Himalaya; he means the Great Himalaya in Nepal. By Kailas-Karakoram or Karakoram-Kailas, I mean that section of the Kailas that lies in the Karakoram region. When we are talking solely of the Karakoram region, we may abbreviate them perhaps as the Kailas, the Muztagh, and the Aghil.

On crossing the Muztagh range, conditions change. It is cumbersome to speak of "the conditions of the country on the far side of the main range of the Karakoram." Nor would it be accurate to say "Trans-Karakoram conditions," for that would exclude the typical Karakoram country between the main range and the Yarkand river in Raskam, since it is uncertain whether we refer to the region or the range. But if we say "Trans-Muztagh conditions," it is obvious

that we mean the conditions beyond the main axis of the ice mountains. I have explained these changed conditions on page 74 of my report.

Sir Sidney Burrard seems to me to argue the question from General Walker's point of view in 1880. He gives the dates "of the principal events in the history of Karakoram Maps" as follows: Before 1820, 1853–1854, 1855–1865, 1866–1869, 1868–1872, 1876–1878 and 1879. I am not belittling these years, nor the great men who made these years great. But what about the years after 1880? What about 1887 and 1889 (Younghusband); 1891 (Cockerill and Conway); 1909 (Abruzzi, De Filippi and Longstaff); 1913 (the Workmans and Grant Peterkin); 1914 (De Filippi and Wood)? Surely it is the detailed exploration of these years that really counts to-day. Sir Sidney's dates stop short of the discovery of the Aghil range, of the Shaksgam river, and of the correct alignment of the range north of the great glaciers, the Baltoro, the Hispar, and the Siachen. Hayward's map shows the tributaries of the Yarkand river flowing north from the main range of "hairy caterpillars," and shows them on a very small scale. Godwin Austen's planetable of 1861 showed a dotted line from east to west with the inscription, "supposed course of the Hunza river, but which may have a long branch farther north." Hayward was given the name Karakoram north of the Karakoram pass, and the name Mustagh for the ice mountains. Godwin Austen has himself told me that his instructions were that he was not to "waste time in surveying barren country above 15,000 feet." One has only to read Colonel Wood's postscript at the end of his 'Explorations in the Eastern Karakoram and the Upper Yarkand Valley,' to realize the effects of this instruction and to get some idea of the roughness of the material that the old geographers had to go upon. Consider Johnson's topography of the upper Karakash and of the vicinity of the Karakoram pass, together with the comments of Colonel Wood. Look at the old Rimo Glacier and compare it with the one surveyed by De Filippi. Are they the same? See the glacier tributaries of the Siachen and of the Siachen itself, and compare them with Longstaff's exploration and his prophecies, so admirably fulfilled this year by the discoveries of the Vissers. Look at the geographical insignificance of the Nubra-Shyok watershed on the old atlas map, and compare it with what we know now from the explorations of Neve, Longstaff, Gompertz, and the Vissers. To-day I have received a letter from Khan Sahib Afraz Gul Khan, in which he details the exploration of the Shyok side of the Nubra–Shyok watershed. The old map was little more than guess-work, sketched from a long distance on a small scale. Remember that when Longstaff crossed the Bilafond pass as late as 1909, he thought at first that he had crossed the Central Asian watershed! This was after the publication of Sir Sidney Burrard's book. I am not casting discredit on the old surveyors: they did all that they were asked to do; but the accumulation of geographical knowledge is a gradual process, and early ideas must surely be modified when later facts are known.

Sir Sidney Burrard quotes me as saying: "It is first of all Moorcroft's misapprehension and then a misunderstanding of Hayward's intention, and of the observations of Montgomerie, that led European geographers to use the term *Karakoram range* as it is at present applied." I meant to stress the word *geographers* as opposed to active surveyors rather than the word *European*. Is it heresy to suspect that General Walker and consequently Sir Clements Mark-

ham, those great geographers, may conceivably have been mistaken in interpreting the views of Moorcroft, Hayward, and Montgomerie, all of whom were dead before the name Karakoram first appeared as a single range upon the map? Surely in view of this scanty knowledge of their time they must not be considered infallible. Neither had seen the country to which they were allotting the name Karakoram. I must risk being further misunderstood to substantiate the remark that has been quoted. Moorcroft's misapprehension was that *the watershed* between the Indus and the Tarim basins lay on a great range. It does not. But the map drawn in the drawing-office showed it to be a great range. Burrard says: "On almost all maps the water-partings are made the most conspicuous ranges." This watershed range, which passed through the Karakoram pass, was the primary cause of the name Karakoram being given to the water-parting, and afterwards adopted for the range. Hayward explored part of the Yarkand valley, but did not reach the source, nor discover that there were two ranges (the Aghil and Muztagh). He heard the name Muztagh for the ice mountains and called the only range he knew of, *Muztagh or Karakoram*, his first preference being Muztagh. Montgomerie, who only saw the summits of the peaks from the distant south, called the whole region "K" (=Karakoram). But he either accepted Hayward's nomenclature, *Muztagh or Karakoram*, or preferred that order himself. Godwin Austen, who first surveyed part of the main range, always alluded to the range as the *Muztagh*. As late as 1924 he corrected me when I referred to it as the Karakoram.

Sir Sidney Burrard remarks: "But while Montgomerie and General Walker at Dehra Dun were rejecting Muztagh, they were hesitating to adopt Karakoram." There is no question that Montgomerie and Walker were closely associated in many enterprises and were the closest friends. But is there any evidence that Montgomerie was rejecting Muztagh? Is it not possible that there was a little friendly obstinacy on the part of both? General Walker alone had the power to select either name for the map. As his subordinate, Montgomerie may have gone to the extent of conceding the Karakoram alternative, but he did not reject Muztagh. Is it only a coincidence that Hayward died in 1870, and that no name was given to the range in 1872, though parts of it were surveyed by Godwin Austen in 1861? Is it a coincidence that the name Karakoram appears first on a triangulation chart, covering all the area enclosed by the "K" peaks of Montgomerie? Is it a coincidence that it appears first for the Muztagh range alone on the maps of 1880, two years after the death of Montgomerie? I firmly believe that Hayward, Montgomerie, and Godwin Austen, the surveyors, were in favour of *Muztagh;* while General Walker and consequently Sir Clements Markham, the geographers, accepted *Karakoram*.

Sir Sidney Burrard writes throughout his criticism as though the *inhabitants* use the name Karakoram. There are no inhabitants. On both sides of the main ice-range there are traditions of two passes, both the Muztagh. Colonel Wood writes: "The name (Karakoram) is applied by the traders to the pass alone and not to the mountains. Dr. Thompson, who in 1848 was the first European to reach the pass, found the same in his day, and Hayward, in 1869, repeats the same information." Wood found the same in 1914, and I the same in 1926. It is we Britishers who have applied the name both to a region and to a watershed range, which is not a primary structure. There is no question of the Mongols

having applied the name Karakoram to the range, though they may have done so to the pass.

I have tried to make my position clear, that I criticized our sagacity, not that of our great predecessors. Would they be impressed with our sagacity if we retained a faulty nomenclature merely on principles of conservatism? Did they retain the elephants and dragons shown by their predecessors on the maps of Asia? Sir Sidney Burrard concludes that the growth of traditions "has been due to the continued co-operation of successive generations of men." Surely the succeeding generations are entitled to build on the foundations of the past.

HIMALAYAN NOMENCLATURE

DR. T. G. LONGSTAFF

IN approaching this most difficult subject we must be clear as to the precise context in which the nomenclature is to be used. Burrard and Hayden's standard work adopts a system which appears to me admirable for what I would call a large-scale description essentially physical and geological in outlook; and I should be very sorry to see any of this nomenclature changed. But the traveller, the mountaineer, the mere topographer, must use smaller units than we find dealt with in the classical 'Sketch of the Geography and Geology of the Himalaya Mountains and Tibet.'

Any system must be arbitrary: for example, when standing on any height between Gilgit and Hunza I have found it extremely difficult to visualize where the Karakoram ends and the Hindu Kush begins! Yet it is definitely convenient to use two different names, though we recognize that our system is a purely artificial one. Another example which is also familiar to me is the exceedingly well-defined group of peaks bounded on the north by the Saser Pass and on all other sides by the upper Shyok and Nubra rivers; I have only penetrated it once, but I have been completely round it; it forms a topographical unit if ever there was one, and yet it fits in schematically with both the Karakoram and the Kailas systems of Burrard and Hayden: I mean that this north-to-south topographical unit fits in with two immense east-to-west geological or geophysical units. The latter system is excellent for the purpose of systematic description, but most unpractical for the explorer or topographer studying the actual mountain complex on the ground. He can only speak of the "Nubra-Shyok Group" or of the "Nubra Peaks" because their approach is only feasible from the Nubra Valley, just as in the Alps we speak of "the Zermatt Peaks," or of the "Bergamasque Alps." With much diffidence I ask for the removal of the label "Kailas Range" from the peaks along the north bank of the Indus about Skardu, for to the onlooker they are indivisibly only the southern axis of the Karakoram. They may be tectonically a continuation of that axis of elevation marked by holy Kailas of Tibet, but both ranges I know, and each is so different from the other, and Kailas is so far from Skardu!

I see no alternative but to make use of two systems of names; what I would

call the "schematic" and the "topographical." Let us stick to Karakoram, rejecting Muztagh altogether for the reasons adduced by Sir Sidney Burrard, and particularize by using well-known topographical labels for splitting up the main axes of elevation. The "Saltoro group," the "Baltoro Peaks," the "Western Karakoram," the " Eastern Karakoram," are all ready to our hands for the differentiation of units of this great system, which is already so extensive that I would deprecate adding the Aghil range to the complex and would preserve its separate designation on historic grounds: at the same time registering my belief that the Karakoram Pass belongs physically to the Aghils rather than to the Karakoram system. But we cannot change the name of the Karakoram Pass.

Burrard's names "Ladakh Range" and "Zaskar Range" are good examples of the sort of topographical compromises I advocate. The Himalaya itself is better known than the northern systems and its nomenclature is less open to argument. We use the title as we use "the Alps," and distinguish the Himalaya "of Garhwal," or "of Bhutan," or the "Nanda Devi group" as the case may be. But the case of the Karakoram is admittedly more difficult. We might agree for convenience to make use of river valleys, which are hereabouts generally important lines of human communication, and define its western boundary as the Gilgit River, separating Karakoram from Hindu Kush; its southern boundary as the Indus-Shyok, instead of labelling the southernmost range as a continuation of Tibetan Kailas; the northern limit as the Shaksgam and Shingshal rivers, separating Karakoram from Aghil, for surely the face of the country is very different on the two sides of this great river trench. On the east the most *natural* limit seems to me to be the upper Shyok Valley, though having route-hunted east of this with Captain D. G. Oliver in 1909 I must admit that our knowledge is so defective that on this side we cannot speak with any certainty and our decision must be merely an arbitrary one and, worse than that, perhaps only temporary! But there is a very obvious change in the character of the ranges on the two sides of the upper Shyok, and as we penetrated eastwards conditions became definitely Tibetan in character and completely different from the Eastern Karakoram, in which I had travelled for the previous three months.

THE MISSING DRAFT PROJECT OF DRAKE'S VOYAGE OF 1577–80

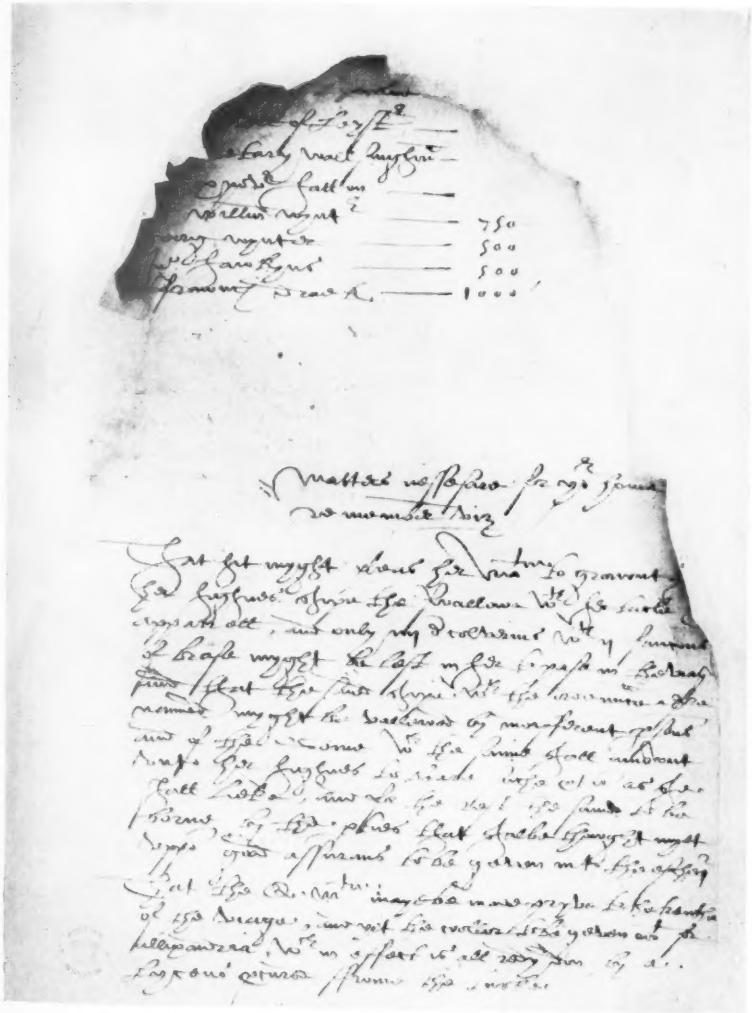
MISS E. G. R. TAYLOR

UP to the present, all discussions as to what plan and instructions Drake carried with him when he finally sailed for Magellan's Strait in December 1577 have been based upon after events—upon the course which he actually followed, and upon narratives written, and depositions made, when he returned a national hero. In searching for material that should throw light on the geographical ideas which shaped the English maritime expansion of the Tudor Period, the present writer discovered two documents in the British Museum which must be reckoned of first-class importance. The first (Cotton MSS., Otho, E VIII), consisting of three pages, two of which are here reproduced in facsimile, is the draft plan of the voyage which subsequently took shape as a circumnavigation of the world; the second (Lansdowne MSS., No. 100) is the report made by John Winter to his father, George Winter, and his uncle, Sir William Winter, on 2 June 1579, the day he reached England, nearly eight months after losing sight of Drake in the South Sea. This report was made before news of Drake's spectacular looting of the Spanish treasure ship reached England.

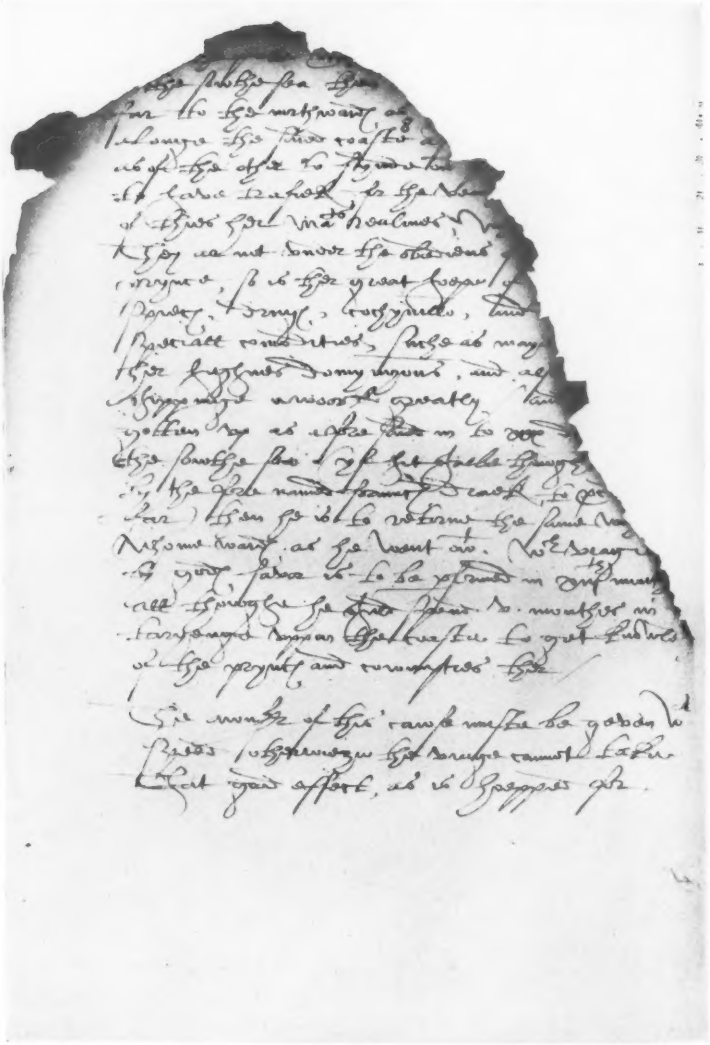
Considerations of space forbid a complete discussion of these documents, which would involve a review and re-estimate of all the voluminous Drake material (a task which the writer has scarcely begun), but an attempt will be made to indicate their significance.

The first page of the facsimile (the second of the document) gives a list of the promoters of the voyage—the Lord High Admiral (the Earl of Lincoln), Leicester, Walsingham, Hatton, Sir William Winter, George Winter, John Hawkins and Francis Drake. The specific investments of the four last named are stated. This list has hitherto been a matter of speculation and inference only. The note following it refers to obtaining one of the Queen's ships, the *Swallow*, to take part in the voyage, a proportion of the value of this ship to represent her Majesty's investment. Of greater significance is the last paragraph, "that her Majesty be made privy to the truth of the voyage," indicating the early stage at which the plans then stood. The first page (not reproduced) gives the name of Drake's bark the *Francis* as one of those to be employed, besides the number of pinnaces to be carried in pieces, and contains details of the provisioning and furnishing of the vessels, significant points being the sheathing against worm, necessary for a voyage through the Torrid Zone, and a sum of £50 set aside for presents to the "lords" of the countries to be visited.

The third page (the second of the facsimile), containing the plan to be followed, is unfortunately the most seriously mutilated. Careful examination reveals, however, that the ships are to go and return by Magellan's Strait, that unknown shores not in the possession of any Christian Prince are to be visited, and that, if it seems advisable to Francis Drake, the voyage is to be extended to 30 degrees, while its duration is to be thirteen months. While it is impossible to adduce proof in the space available, the writer considers it beyond doubt that the coast to be examined was not that of Western America, already in



Second page of the Draft Project of Drake's Voyage (Cotton MSS. B.M.)



Third page of the Draft Project

Spanish possession between 40° S. and 35° N., but that of Terra Australis as shown on Ortelius' map of 1570: this coast ran north-west from the Strait, its term was Locach or Beach "rich in gold," and the Moluccas. It was Beach which John Dee regarded as the main objective of British enterprise,* and it can be conclusively proved that Ortelius' 'Theatrum' was in the hands of every English cosmographer in the '70's.

The Winter document shows, as indeed the event proved, that the first draft plan was subsequently greatly extended. The voyage was no longer to be limited to a reconnaissance as far only as 30°, but was definitely to be extended to the Moluccas. After losing sight of Drake, Winter retreated into the Strait, and prepared his company's minds for what was to come by reading them Magellan's voyage (no doubt from Willes' 'History of Travayle,' published in July 1577). Later, however, the Master flatly refused to steer west, and since contrary winds forbade making for Peru (here definitely shown to be an alternative plan), Winter reluctantly turned homewards; but he must be definitely absolved from the charge of desertion repeatedly made against him.† Winter clearly realized that the existence of the belt of strong westerly winds, which he had proved from 40° S. to 57° S., precluded a voyage to the Moluccas by the shore of Terra Australis, although it did not preclude following in Magellan's track. His statement is so important from many points of view (*e.g.* his observations about the Doughty affair) that arrangements are being made to publish it *in extenso*.‡

There is little doubt that, although the official plans of the voyage were for Terra Australis and the Moluccas, or failing these for the Straits of Anian, Drake had in his mind, with the Queen's connivance, reprisals against the Spaniards: the organization of the South Sea voyage gave him the opportunity, and the weather conditions experienced on leaving the Straits gave him the excuse, for turning northwards. Had he discovered, in 48° N., the mouth of an Anian Strait leading north-eastwards as many imagined it, he might have returned that way, as Sarmiento felt sure he had done; the Moluccas, however, were still in his mind, and to the Moluccas he went, not without hope, perhaps, that Winter would be there.

*E. G. R. Taylor, "John Dee, Drake and the Straits of Anian," *Mariners' Mirror*, May 1929

†H. Wagner, 'Sir Francis Drake's Voyage around the World' (1926), p. 64.

‡In the *Mariners' Mirror*.

THE ZERZURA PROBLEM

FROM time to time in the *Journal* during the last few years we have published papers and notes dealing with the question of oases in the Libyan desert, reported by Arabs, but never yet found by any European traveller; and in particular the legendary oasis of Zerzura. As the subject is rather complex, it may be convenient to preface a new group of notes on Zerzura by a brief summary of what has gone before.

In his paper on "Problems of the Libyan Desert" (*G.J.*, 70, 1927, 125) Dr. John Ball maintained that if Zerzura is within the present boundaries of Egypt it must lie in one of two regions: a northern region extending from Siwa about 200 miles to the south; and a southern, about the oasis of Bir Terfawi, east of 27° and south of 23° 30′. He excluded the region south-west of Dakhla towards Owenat, because the static water-level is there too deep below the ground surface.

Mr. Harding King (*G.J.*, 72, 1928, 246) disagreed with this argument, maintaining that even a slight rainfall might provide accumulation of water for a small oasis, and believed that Zerzura would be found ten or eleven days from Dakhla towards Owenat.

Dr. John Ball (*G.J.*, 72, 1928, 250), replying to this note, differed from Mr. Harding King on geological grounds; maintained that his "olive oasis" must be Owenat; and discussing his reference to a passage in the *Book of Hidden Pearls*, which mentioned a Zerzura (misprinted Ferzura), believed that the city of Warde or Wardabaha there referred to was one of a series of abandoned villages on the western edge of the Faiyum north of the Wadi Rayan. He argued finally that the lost oasis of Zerzura is mythical.

Mr. Newbold (*G.J.*, 72, 1928, 547) described in a preliminary communication his search for oases in the Northern Sudan, just across the border from Ball's southern region. He agreed with Dr. Ball that the "olive oasis" could not lie between Dakhla and Owenat, but in spite of the geological objections thought there was much evidence for an old route from Dakhla to Kufara on which water must have been available.

The group of papers which follow includes an account by Colonel de Lancey Forth of an unsuccessful search south of Siwa and west of Abu Mungar, in Ball's northern area; a note by Johnson Pasha on the MS. evidence that the Zerzura of the Book of Hidden Pearls was not in the Faiyum but within reach of Dakhla; a further note by Mr. Harding King on the problem; and a review by him of the full account of Mr. Newbold's journey published in *Sudan Notes and Records*.

MORE JOURNEYS IN SEARCH OF ZERZURA

LIEUT.-COLONEL N. B. DE LANCEY FORTH

I HAVE been much interested in reading in the *Journal* articles on problems of the Libyan Desert and Zerzura, the undiscovered oasis, for during the winters of 1921, 1922–1923, and 1924 I made three journeys into the northern of the two areas in which Dr. Ball thinks Zerzura may be found.*

*See *G.J.*, 70, 1927, pp. 21–38, 105–128, and 209–224.

In 1921, accompanied by Colonel Macdonnell, the then Governor of the Western Desert of Egypt, I penetrated with a Camel Corps patrol some considerable distance into the unknown dune area south of Siwa, reaching a point about 100 miles south of that oasis. The journey was so interesting that I determined to try and repeat it when the opportunity arose and, if possible, to go farther, in fact to the limit of my camel's endurance. In 1924 I made a second journey, in company with Captain Hatton, M.C., of the Frontier Districts Administration, to whom I was indebted for the arrangement of all its details.

Before we started a dump of water was placed at the farthest point reached in 1921. On the second journey we penetrated about 100 miles farther, to a point about 200 miles due south of Siwa. This and other distances were calculated by estimating the pace of the camels, and in this way prismatic compass traverses were kept up on each of the three journeys. The rate necessarily varies greatly according to the country, but after twelve years' practice while serving in the Sudan Camel Corps and commanding the Frontiers Camel Corps of Egypt, I have found that if care is taken one is never so far out as one might expect, even after days of travelling.

Our route lay well to the west of Rohlfs' trek in 1874 from Regenfeld to Siwa. About 40 miles south of Siwa the sand-dunes became very high and continued so to about the limit of our journey(see later under "Sand-dunes"). After a further 40 miles we found a very old track going due south, following a valley between the dunes, but lost it when the valley became blocked by a sand barrier, and did not pick it up on the farther side. As we travelled south we marked our route with thin palm branches placed in conspicuous positions, at distances varying from a few hundred yards to a mile or more apart, according to the nature of the country. At the farthest point reached a flag and bottle with the names of the party were left.

We saw ostrich egg-shells and flint implements daily, but no bird-life. After the first 100 miles from Siwa, however, we found dead quail under every formation that gave shade. Jerboa can be found in places in this country, but it is a mystery what they live on. In one or two sandy valleys we came on odd green bushes, too bitter for camels to eat, but there was no other vegetation. We saw no other life and no other traces of travellers of any kind.

In the winter of 1922–1923 I investigated the country west of the Dakhla–Abu Mungar escarpment westward to a point near Rohlfs' Regenfeld in the south and his Ammonite Hill in the north. Captain A. D. Macdonald, M.C., Lancashire Fusiliers, now in 'Iraq, was responsible for the ground work of this journey, bringing camels and men from the Nile Valley via Kharga and Dakhla. He accompanied me to a point south of Bir Abu Mungar, where I entered the sand-dunes with the strongest camels of our party, and he was unselfish after all his hard work in not pressing his claims to continue the journey in its interesting part.

In the dunes and wadis lying between the Dakhla–Abu Mungar escarpment and Rohlfs' route from Regenfeld to Ammonite Hill, I travelled backwards and forwards in every direction, led by a man who said he had once seen in the distance what appeared to be palm trees and vegetation when travelling from Kufara to Abu Mungar, after his party had temporarily lost their way. He explained that they had not turned aside from their journey to confirm it, as

they were in desperate straits, having been caught in a heat wave, and were pushing on to Abu Mungar, where they were certain of obtaining water.

This man after some days lost all knowledge of his whereabouts. (I calculated afterwards that he took me too far south and not far enough west.) When he

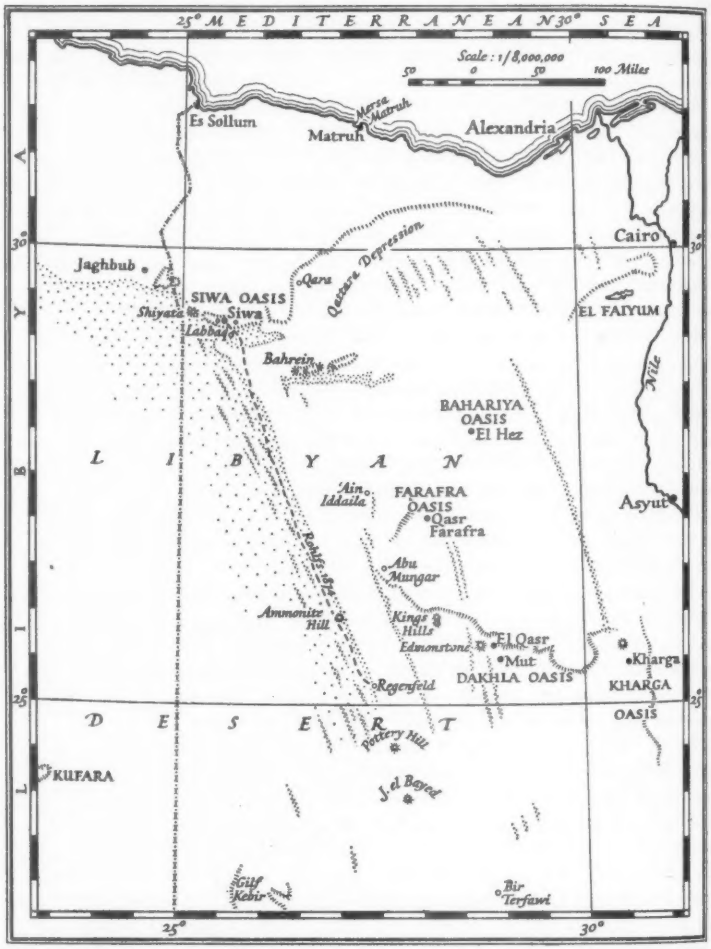


Fig. 1. Sketch-map to illustrate Colonel de Lancey Forth's Journeys in the North Libyan Desert

acknowledged that he was lost I took charge, having checked his movements as far as possible, and made for Ammonite Hill, which we hit off accurately. This is a very conspicuous massive black hill, standing high above the sand-dunes, which here were themselves of considerable height. I did not actually

visit the hill or climb it, as I thought that if there was anything to be seen from its summit Rohlfs would have reported it, and I did not want to waste time. I have since regretted that I did not do so.

Up to this point we had seen no trace of animal or bird life of any kind, but about 10 miles north-east of Ammonite Hill we found a valley thinly grassed for a mile or two. We had had two or three weeks without a breath of wind to disturb the sand, and many tracks of jackal and foxes were seen. These came from the north or north-west, not from the south or east. Birds that were certainly not migrating came to our camp and remained with us for an afternoon halt that I made.

As our camels were giving out we now turned directly back towards the Abu Mungar escarpment, through country which looked promising, with a small east-to-west escarpment 200 or 300 feet in height, over which the dunes ran without a break, but found nothing, and traces of animal-life disappeared as we went east and back towards known water.

On returning from my last trip south from Siwa in 1924, at Mersa Matruh I met a Senussi leader of importance who was detained there seeking protection from the Italian authorities. This man was more communicative than usual owing to the circumstances in which he was placed. I told him where I had just been and for what I had been seeking. He said, "The oasis is there. You went too far west and south. Next time you seek for it go to Abu Mungar and go into the dunes west from there." As I had not mentioned Abu Mungar to him, nor my journey from there the previous year, and the information had not been prompted by me, it was particularly valuable in view of the animal tracks which we had seen near Ammonite Hill, coming from the north or north-west.

In connection with the evidence of such tracks it should be remembered that when we saw those of jackal and foxes we had had two or three weeks of exceptionally calm weather. I have often seen it written and heard it said that when searching for Zerzura animal tracks near it or ancient roads leading to it would help the searcher to find it. This would not necessarily follow in the "northern area," where it would be surrounded by sand. The little oasis of Labbaq lies in a depression in the sand hills entirely surrounded by sand, about 10 miles south of Siwa. It is visited all the year round by Siwians and the Camel Corps, and yet, though I have been to it frequently, I have never seen anything approaching a track of any kind leading to it, except camel droppings lying on the surface of the wind-swept sand. Except at one place you could pass within a few hundred yards of the oasis and never know it existed.

I discard all information about Zerzura given by the inhabitants of Dakhla as almost worthless. They are not desert people, and the only desert routes they are ever likely to follow are the known ones to the Nile valley or Farafra. They will tell you with the greatest confidence, "Zerzura is three days from Dakhla in the sand-dunes," especially if they think you are anxious to believe it. They told me the story of the man and woman and the cow coming in from Zerzura. How it originally arose I do not know, but if it is true I do not believe they came from the "Northern Area." Of one thing I am certain. If an oasis is found in this region it will not be inhabited, but I believe it to be there. If it is where I believe it will be found, *i.e.* west of Abu Mungar or Farafra, I think it is not

known to present-day Arab travellers because the nature of the sand-dunes lying to the west of it (see later) makes it of little use as a stepping-stone to or from Kufara, without making a considerable detour.

I see that Mr. Harding King states in his book 'Mysteries of the Libyan Desert' that according to native information there is a large oasis three days south-west of Iddaila (north of Abu Mungar). His native information has proved generally good and confirms my belief that there is an oasis west of Abu Mungar. I think it will be found somewhere near the latitude of Zerzura on his map, but not so far west as he has placed it. I came to this conclusion after exploring in that country and before I had seen his book, and I do not know from where he obtained his information. I have often questioned the old black postman at Siwa, who in former days carried the post single-handed direct from Siwa to Kufara. He may still be alive. His starting-point was Labbaq. He always insisted that he did about twelve days to his next water. Not only from his story but also from first-hand evidence of the state of camels arriving at Labbaq from Kufara, I am convinced that on this route they get no water after leaving Labbaq in Egyptian territory.

Arabs going from Farafra or Dakhla to Kufara make Abu Mungar* their

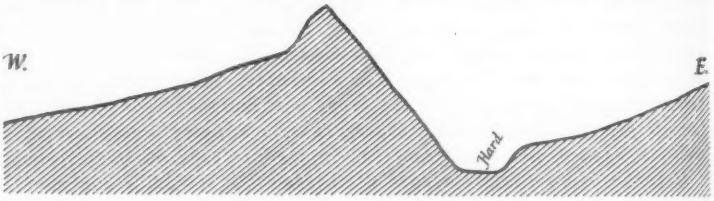


Fig. 2. Typical section through sand-dune south of Siwa

starting-point, and pass by Ammonite Hill. All our evidence is to the effect that they get no water in Egyptian territory after leaving Abu Mungar. Even if those of us who have questioned travellers have been deceived on this point because the Senussi treasure the isolation of Kufara, I am sure his Highness Prince Kemal el Din would long ago have extracted the truth if it were different from what we believe it to be.

An oasis will have to be looked for away from these two Arab routes. It will be found, I think, west of Abu Mungar within a long day's journey north or north-west from the point where I met so many tracks of animals about 10 miles north-east of Ammonite Hill.

Mr. Harding King has informed me that Sheikh Muhammad el Mawhub, at one time head of the Senussi sect at Dakhla oasis, used to start with only five days' water from Abu Mungar on his way to Kufara. This being so it is conclusive evidence that there is an oasis lying somewhere to the west or north-west of Abu Mungar; otherwise the old man would never have been heard of again. The probability is that the Sheikh, being old and feeble and softened by leading the life of a religious recluse, made a detour to it, to rest and to obtain

*This is the "Mongar" mentioned by Newbold in the *Journal* for December 1928, p. 549, but it lies north-west of Dakhla, not west.

1. Sand-dunes south of Siwa, showing eastern slopes and hard ground at their foot

2. Open sandy country, with occasional small dunes, about 200 miles south of Siwa: farthest point reached in 1924

3. The desert road (Darb el Gubari) between Kharga Oasis and Dakhla Oasis, showing escarpment to north

4. Water depot placed at farthest point reached 1921, about 100 miles south of Siwa

5. Pass out of Dakhla Oasis, between Rohlfs' Jebel Edmonstone (in distance) and his escarpment

a further supply of water instead of following the usual Arab route on the long and dangerous journey to Kufara.

The sand-dunes

South of Siwa the sand-dunes for the first 30 or 40 miles, though tending to run in a southerly direction, are tossed about in a more or less jumbled mass. Then they run in very regular lines as far south as we could trace them, a south-south-easterly direction, but I think nearer south than they are shown

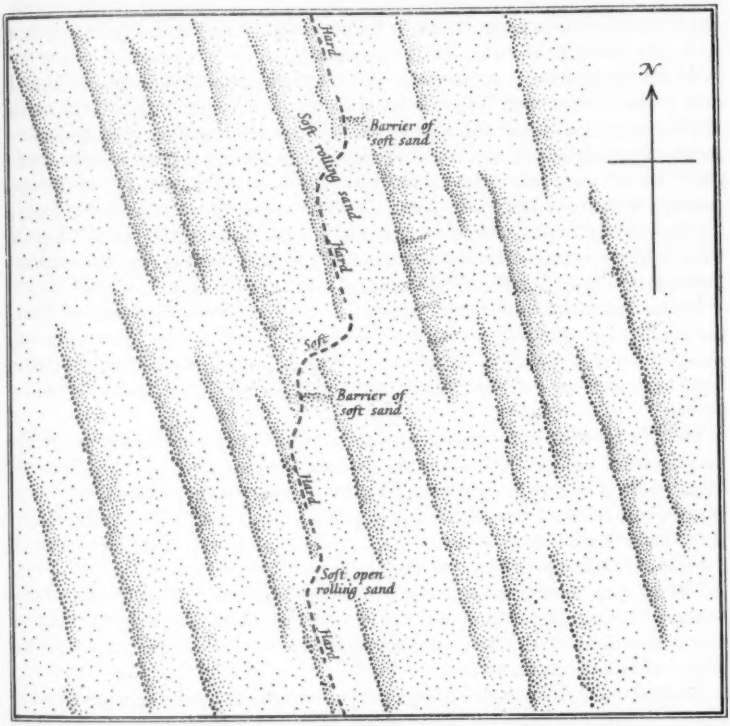


Fig. 3. Diagram showing method of travelling south through great dunes south of Siwa

on existing maps. They are at their highest from here on for another 100 miles, and the interval between them varies from a few hundred yards to a mile or more. Camels would soon tire travelling here from east to west, and many of the dunes could not be crossed by them at all without making a long detour. It would not be so difficult to cross them from west to east, but still impracticable, I think, for a long journey. The western slopes are usually very gradual, the eastern steep with good hard going at their foot. I never found good going on the western side. Crossing these dunes from east to west one usually has to

climb 200 or 300 feet with effort up the eastern slope, to find on arriving at the top an almost knife-edge summit and a drop of about 20 or 30 feet on the western side, followed by a long gradual slope down to a little valley where there is hard ground at the foot of the next dune to the west (see Figs. 2, 3, and Phot. 1).* If one hugs the eastern slopes, following the little valleys at their base, one will get stretches of good going for 5 to 10 or 12 miles at a stretch.

At varying intervals the valleys are blocked by barriers of soft sand into which camels sink to above their knees and hocks. These barriers usually have a gentle northern and a steep southern slope. Fig. 2 shows diagrammatically the kind of route a caravan would follow when endeavouring to move in a southerly direction through this dune country.

At the farthest point we reached, about 200 miles south of Siwa, we looked over a sea of sand with isolated dunes of no great height. They were much farther apart than those through which we had been travelling, and of comparatively small height, and could be easily crossed from east to west or west to east. An old coastguard Arab who had patrolled the Farafra–Abu Mungar country in the days before the war, said to me as we emerged on this country, "Now we know how the Senussi come across from Kufara to Mungar." Up till then it had evidently puzzled him as it had puzzled me, seeing the country through which we had travelled farther north.

Motor cars would be impracticable for the first 200 miles south of Siwa, even following the valleys between the dunes, owing to the barriers of soft sand by which the valleys are blocked. Probably even cars of the caterpillar type, such as those used by Prince Kemal el Din on his expeditions, would be useless.

I found that palm branches stripped of their leaves except at the top and stuck into the sand and on the dunes make a wonderful guiding mark. Even a small one shows up in certain lights at a distance of 2 or 3 miles. They survive bad storms, and I have found them still in position after a couple of years. They should not be placed on the knife-edge top of the dune, but on the skyline of the more rounded hard slope of its shoulder.

I have often noticed, what is also mentioned by Dr. Ball, that when walking in the early morning after a cold night, both camels and men do not sink so deeply into the sand as later on during the heat of the day, for the surface seems firmer when the sand is cold.

West of the Dakhla–Abu Mungar escarpment the dunes I encountered were usually much smaller than those south of Siwa, and were not difficult to negotiate from east to west or west to east with strong, well-bred camels, lightly laden. I also found harder ground and more stretches of country open and level, with isolated hills between the dunes, than we encountered south of Siwa. Occasionally to cross the soft knife-edge summit of a dune we had to unload our animals and take the loads over by hand; but generally I was surprised at the hardness of the sand, and found it best not to deviate very much looking for an easy shoulder, but to try and keep on a definite line, attempting sometimes what looked the impossible.

An interesting feature which I noticed, and one which must be of great assist-

*The photographs illustrating this paper were taken by Captain Hatton, Captain Macdonald, and myself.

ance to Arabs doing the long journey from Kufara to Abu Mungar or Dakhla, is that the escarpment running from Dakhla to Abu Mungar when approached from the west stands up like a range of mountains (on the old maps it was shown as a mountain range), and can be first seen a long day's march away, running for many miles in its northerly and southerly direction. Its features and the two hills now named King's Hills are easily recognized. Any traveller coming from the west, on sighting this escarpment from the summit of the dunes, can at once get his correct bearings, and, if out of his course, alter it accordingly. I was told that Arabs making for Abu Mungar often went straight to Dakhla if they found on sighting the escarpment that they were too far south in their course.

I have experienced some terrible sandstorms in the heart of the dune country. While they last it is almost impossible for man or beast to travel. Everything is blotted out by drifting sand and the country is unrecognizable. The only danger from these storms however is that they may cause a long halt, and if a caravan has not an ample supply of water it may not reach its next supply. The storms usually last one day, but they may last three. Further, they are often accompanied by a very hot wind, which causes great thirst and so increases the danger. For this reason the advice once given to me by an old Senussi traveller is particularly sound. He said, "The dune country is a terrible country to travel in. Never go into it without taking a double reserve of everything that you would take on an ordinary desert journey, especially in water and spare camels."

I have heard the singing of the sands on three different occasions. The noise is very like that described by Lord Curzon in his book 'Tales of Travel': a rolling sound, like modified thunder, with the deep musical note of a 'cello in it. When I first heard it I thought it was distant thunder. It brought us all to our feet, and the Arab with me, who had heard it before, said it was the Spirit of the Dunes talking. I never heard it except in the evening and where the dunes were very high and steep. It is a strange sound to hear in the stillness.

I found that the noise could be produced in a very minor way by walking along the knife-edged top of the highest dunes after a wind from the west during the day had backed up very fine drift-sand on the top. When this fine sand, light in colour, slid down in streaks over the steep slope of the coarse big-grained reddish sand which formed the solid part of the dune, the friction of the one rolling over the other gave out a deep, quivering musical note. I think this is the solution. I have tried to make the same noise in other parts of Egypt by disturbing the tops of dunes, but have never succeeded. I fancy the narrow valleys between the dunes may help to echo the sound.

From the following evidence I do not think that the dunes in the northern area move much, either east or west, or that the sand covers up objects to the extent that is usually believed apart from the general southerly movement of the dunes.

(1) Two and a half days south-west of the Abu Mungar escarpment we crossed dune after dune close together. They were here roughly about 50 to 100 feet high and closer together than usual, with narrow valleys and hard ground between them. Across one valley we found what was evidently a very ancient wall. At the foot of each dune on either side of the valley a pillar had

been built, and the wall connected the two. From the evidence of the pillars these dunes had not moved inwards since this wall was built.

(2) At the foot of a very high and steep dune, not far from Ammonite Hill on its eastern side, in a sheltered hollow, the natural place one would select for a camp to this day, I found a neolithic or palaeolithic camp, and strewn in the hollow were flint implements of every kind. There were also a great number of corn-grinding stones or hand-mills, such as are still used in the Sudan, and here and there large piles of ostrich shells.

The dune had not moved east nor had the camp been covered up, except by the dust of the dark soil at the foot of the sand-dune.

(3) About 80 miles south of Siwa, also in a natural camping-ground such as one would still choose to shelter in, in the bay of a dune, I saw some flint instruments lying in the sand, and, jumping off my camel to pick them up, I disturbed the sand and disclosed ashes under it. I had the top layer of the sand carefully removed, disclosing under it the bed of a fire with burnt ostrich shells and flint knives in the ashes. The ostrich shells had evidently been cooked on it and neolithic or palaeolithic flint knives were lying in the ashes. In what age that fire had been lit I do not know, but the sand had not covered it up more than a few inches since that period.

(4) The migration of quail has been going on since at least biblical times. After about a hundred miles south from Siwa, under every projection in the sand-dunes that gave shade, we found the skeletons of quail, who had crept in for shade and then died. You will find these buried in layers of sand, and on uncovering them I could never find the bottom layer of skeletons more than a foot or two below the surface.

My own opinion, after noting the movement of sand and dunes of every size and description all over Egypt and the Sudan, is that they do not vary their position as much as is generally accepted; unless some artificial barrier is made by man on ground over which the sand would otherwise have swept on unobstructed; or sheep and goats are introduced which eat out the natural grasses that hold the sand together. A railway line, fence, or enclosure, placed in a position over which sand formerly swept unopposed will in some cases soon cause a sand-dune or hill, which will grow to a great height if not cleared away at its commencement, and will alter the whole face of the country.

Even two or three large stones placed on hard ground over which sand is accustomed to sweep, will start collecting sand which will grow from a little pile a foot or two high to a small hill. I have seen this actually happen on a motor-road marked out with large stones by the Turks in Sinai. The first time I used this road there was no sand apparently in sight. In succeeding years I watched a little pile of sand collect round one or two stones marking the road, and as time went on it grew to a small sand-dune to avoid which one had to make a considerable detour.

I think the small sand-dunes blocking the very ancient road which leads out of Dakhla between Edmonstone and the escarpment going north-west to Abu Mungar, were caused in this way, and although they are now of a considerable size, it is quite possible that cairns marking the route as it left Dakhla have caused the dunes.

H. C. Williams, who spent some years exploring by car in the north of the Libyan Desert, and who is a very shrewd observer, always said he thought that sand and dunes did not vary to any great extent if left undisturbed by man.* Williams always remarked that for every grain of sand blown on to a dune he believed another one was blown off, and vice versa. Most people who think otherwise have only an opportunity of judging the movement of sand in the vicinity of human habitation.

Flint implements, ostrich egg-shells and petrified oyster-shells

Flint implements can be found all through the sand-dune area. Seldom a day passed without our coming on them even in the most unlikely places. I have never seen so many as were lying scattered about in the neolithic or palaeolithic encampment I found near Ammonite Hill. This spot would be a paradise for flint experts, and I could find it again. It was only because my camels were giving out and my one object was to find Zerzura that I did not stop and collect as many as we could carry. I brought back a few, however, and was immensely interested afterwards on visiting the cave excavated at Monaco and going over the little museum at its entrance to find there a case of flint instruments and weapons corresponding exactly to those I had found near Ammonite Hill.

I never found petrified oyster-shells or starfish very far south of Siwa, but in the dunes west of the Dakhla–Abu Mungar escarpment I found a fossilized nautilus, which Dr. Hume said was the best specimen he had seen. Ostrich egg-shells are also seen everywhere.

To any one wishing to search for the oasis which I believe exists west of Abu Mungar I would suggest making Abu Mungar their base and working in two parties. Place a water dump for camels and men two days to the west, marking out the route with palm branches. Then explore from there three days west, three days north-west and three days south-west, the party left at Abu Mungar keeping the dump filled up with water and forage. This is the journey I should make first if it were possible for me to make more expeditions into this country. A westerly route would be more laborious, though the mileage considerably less, than on a route following the course of the dunes and in their trough; but the search would be more thorough owing to the wide outlook obtained from the summit of the dunes as they are crossed.

To explore the northern area generally I would do as Dr. Ball recommends, again make Siwa a base, or (so as to get an entirely new line when moving south) the little salt-water lake of Shiyata, lying at the edge of the sand-dunes in the depression towards Jaghbub from Siwa, at which good drinking-water can be found by digging in the sands a few hundred yards from its western side.

Travellers should be careful to arrange their journeys as far as possible in the middle of the winter season, December to January being the best months. The heat in these sand-dunes can be terrific, and it is difficult to realize until experienced the limitations it imposes on man and beast. To an exploring

*I think the dune mapped by Calliaud on his journey to Bahariya in 1820 is still as shown by that explorer, about 80 kilometres in length, with the same gap in the centre—standing isolated on hard ground.

party caught unprepared far away from their base, a spell of hot weather might mean a disaster.

I would advise a reserve of camels and water double that one would take on any other journey of the same length in ordinary desert country. With regard to camels, breeding counts, and I have always found well-bred *seasoned* riding-camels from the Sudan, not too short in the leg, with strong hind quarters, well ribbed up, and with good chests, the best animals for the heavy work to be met in the dunes. Their load, apart from the man they carry, should be light. The transport camels working from the base must of course be good strong desert baggage camels.

Conditions vary in Upper Egypt as to the most suitable place for buying camels, and I would advise any would-be explorer to consult the O.C. Frontiers Camel Corps, or the O.C. Camel Police in Cairo. They would also give information as to where suitable men may be engaged. These on no account should be Egyptians or men born in the Nile Valley. If the O.C. Camel Corps could help with eight or ten Camel Corps men with their own camels, their assistance would be invaluable.

Looking at the map, it would appear simple, if given a general direction, to locate an oasis. Experience of travel in this country will teach that it is a very different matter. Any true lover of the desert, however, will find exploring in these huge sand-dunes intensely interesting. They are almost terrifying in the way they swallow you up and cut you off from the outside world, once you are in their midst, but they grip you with a fascination that would compel a man to return to them to look for their secrets—if given the opportunity.

Two stories referring to an undiscovered oasis may be of interest to searchers for Zerzura.

One of my men, whom I had found I could trust, told me that in the old coastguard days he was camped with others at Abu Mungar while on patrol duty. One evening a man on a camel, who from his description I think was undoubtedly a Tuareg, tried to steal a camel from their camp. He was caught doing so, but escaped. Next morning they found his camel tracks coming from the west and returning to the west. They followed his tracks for two days and then lost them.

Even a Tuareg would not play about in that country unless he had water in some place not yet known to us.

Major Jennings-Bramly told me that many years ago, when he was travelling in the Siwa–Farafra region, he was told by two Arabs that on one occasion they lost some camels, and had gone a long way into the sand-dune country searching for them. They told him that there they came on a lake surrounded by palm trees with some old ruins, but what seemed to impress them most was the enormous number of wildfowl on the lake. Major Jennings-Bramly tried to trace the Arabs for me, but owing to the long lapse of time was unable to do so.

I was particularly interested in this story, and especially in the mention of wildfowl on the lake, owing to my own experience when travelling once with a light car patrol from Siwa to the oasis of Qara, 80 miles north-east of Siwa. Siwa is connected to Qara by a telephone wire which runs due east along the top of the plateau for about 25 miles. Following this stretch of 25 miles of

telephone in the early morning, I picked up at intervals of 4 or 5 miles apart four pin-tail duck which had struck the wire during a large migration to the north in the night. They were all fat plump birds, and three of them we ate. The fourth had only a broken wing, and I eventually handed him over to the Cairo Zoo, where I left him swimming about happily in the garden lake. No birds, except in small numbers, appear to settle on the salt lakes of the Siwa depression. These duck may have come from the Dakhla oasis, but if so they were flying west of north, and here I always have seen flights from the south flying east of north, making, I think, for the Nile Delta. They may have come from Kufara, but they also may have come from an expanse of water south of their flight not hitherto known, and this would put it in the dune area.

On my telling this story to Lord Allenby he remarked that, apart from anything else, he thought it was of interest owing to the breadth of the flight and that the birds were flying so low at night.

ZERZURA

E. A. JOHNSON PASHA

RECENT discussions as to the possible actual existence of Zerzura, the alleged "lost" oasis to the south-west of Dakhla, and the discovery of an allusion to it in what is vulgarly called the Kitāb al Kanūz, an Arabic manuscript in my possession, seem to make it worth while to record my own views on the subject. The manuscript has been in my possession for many years. The Department of Antiquities borrowed it for translation in (I think) 1905. I have of course known that the note about Zerzura was in it, but it may be a new thing to others.

I see that an ingenious suggestion has been made that the tradition of Zerzura started with the inclusion of a village bearing the same name in a list of deserted villages on the north-western border of the Faiyum written two hundred years earlier than the Kitāb al Kanūz. I think that this, though ingenious in the way of controversy, cannot be taken seriously when we are attempting to get a lead as to existence of the traditional Zerzura from actual facts.

It is now said, "it may be conjectured that Zerzura lay somewhere to the north of the Wādi Rāyān." But even now, from the northern surveyed border of the Wādi Rāyān to the base of the hills bordering the Birket Qarūn is quite a moderate day's ride. There are many traces of ancient cultivation, and, if I remember right, traces of quite small villages here and there besides the Qasr Banāl and the Qasr Qarūn; but to suggest that a deserted village lying in such a place could be the source of a tradition as to the existence of a forgotten town amid pathless deserts is really more like poking fun than serious discussion.

I have known this locality pretty well at various times, and I never heard a word about this Zerzura, though I know no reason why there should not be many such villages. There may or may not be some connection between the

name "Zerzura" and the bird said to be carved on the door. The entry in the book is a subordinate heading in continuation of a description of the Deir el Qalamūn in the Oasis of Dakhla. The words صفة مدينه appear in red ink at the left-hand of a line, and the words ودربها also in red ink on the right hand of the next line.* I can see no reason for supposing any intention on the part of the scribe of breaking off and beginning with another locality. Besides, he notes that the road at its beginning passes through palms, vines, and running springs, which pretty clearly shows that he is still dealing with the oasis. There is no mention of any *Ville de Warde* or *Ville de Wardabaha*.

The translation of the text is: "Description of a town and the road to it† which lies east of the fort Al Suri (or perhaps 'the walled fort') [near Deir al Qalamūn]. It leads through palms and vineyards and wells of running water. Follow the wadi and keep rising until you come to another wadi leading west which rises up between two hills. From this last wadi a road leads off that will bring you to the town of Zerzura, the door of which you will find closed. . . ." [Cf. Dr. John Ball, *G.J.*, 72, 1928, 253.]

In any case the tradition we have to deal with is one concerning the Oasis of Dakhla. Formerly at least you could not pass a night in Dakhla without hearing all about it. And you would not be likely to hear of it even in Kharga unless you started the subject. As for the Faiyum, I have said what I thought.

When I first went to Dakhla (1885–6) I was supposed to be the first high official who had visited the oases since " the killing," which I understand was about the time of Muhammad 'Ali. They spoke a good deal of the "oasis of the blacks" which they distinguished clearly from "Zerzura." They spoke of a Mameluke Bey who had been sent to stop the raids by the blacks and of his having poisoned (? destroyed) the water supply that the blacks depended on before they got to Dakhla.

They asserted that a man who had been lost in the desert and been saved by reaching Zerzura had died in Dakhla only a few years before. They were full of talk about two "wild cattle" that had suddenly appeared coming from the south-west some eight or ten years before. I give these stories just as they told them. Their idea of Zerzura was a fairly large oasis with many trees, springs, grass, and *ruins*, and they always dwelt on wild cattle.

A few words as to the Kitāb al Kanūz: Four or five hundred years ago there may have been many tombs undiscovered that have been rifled long since; but my impression is that the book was compiled to order and paid for. The compiler took all the outlying ruins, etc., etc., and suggested ceremonies and magic; but the object of the man who ordered the book was the desert and the mines.

The compiler visited all the old workings all over the place, and could make little or nothing of them. (Old workings mean very little to the uninstructed.

*Description of a town صفة مدينه, *ṣifat medinet*, and the road thereto ودربها, *wa darbaha*.

†A copy of the Arabic, kindly sent by Johnson Pasha, having been shown to Mr. H. A. R. Gibb, of the School of Oriental Studies, he sends us the following note:

It is clear that the word following the two words in red ink, which read "Description of a town . . .," cannot represent Wardabaha or any other proper name, because the pronouns which follow are masculine (*wahuwa sharqiyya . . . tajidu fihi*), while any such proper name would be feminine. The text as now supplied by Johnson Pasha cannot be read as anything but "and its road."

I have known quite an intelligent geologist say that "they appeared to have been scratching the hills for limonite" when he was actually within a distance measurable in yards of an ancient stope that would have been classed as large in any country, and the quartz remaining in which ran more than 1 oz. to the ton.) The compiler naturally devised magical ceremonies to satisfy his employer. He found areas covered with pyrites nodules, some of them containing lumps of carbon, that any one may find to-day. And of course he explained how you converted these into gold and silver. He found the lines of "signs" on the prominent hilltops and the lines of stones laid on the flats from hill to hill, and could not make out what they were for, and took to cabala again.

THE LOST OASES

W. J. HARDING KING

THE tradition mentioned by Dr. Ball (*G.J.*, 72, 1928, 252) that there once existed a village in the Faiyum called Zerzura, does not necessarily preclude the name from being applied to other places as well. If my derivation of Zerzura, from *zerzur*, a small bird, be correct, the name—like El Dorado—either implies a place surrounded by a halo of romance, whose position is unknown, but which is believed to exist (and a name like this may be applied to any place that answers to the description); or it is one of those names derived from some local features that, since the local peculiarity is likely to be repeated elsewhere, often recur over and over again in the same region—witness, for instance, the name " Eagle lake," which appears at least nine times in the map of North America alone. Either of these views would account for the fact, to which Dr. Ball calls attention (*G.J.*, 72, 1928, 254), of the numerous positions that have been allotted by tradition to Zerzura. But so many of these legends come from Dakhla that it seems probable that, if Zerzura exists at all, it is not very far away from that oasis.

Herr Borchardt heard that the road running south-west from Dakhla oasis led to a place eleven days away called "Zerzura or Owana"* which puts it in practically the same position as my "Olive oasis."† It is curious that both he and I independently heard of this name in its singular form, while Hassanein Bey and Ball give it in the plural—Owenat, *i.e.* the Owanas. This I was told was the name of the district in which Owana lies. In similar cases the name in the singular is given to the principal place in the area that takes its name (cp. Bahama Island and The Bahamas). It consequently appears that this capital place has not yet been found.

In spite of the arguments put forward by Dr. Ball (*G.J.*, 72, 1928, 255) and Mr. Newbold (*G.J.*, 72, 1928, 549) to the contrary, I still think it probable that

*'Mittheilungen aus den deutschen Schutzgebieten' (Berlin, 1916), p. 34.

†'Mysteries of the Libyan Desert,' W. J. Harding King (London, 1925), pp. 91, 320, and 321.

this "Olive oasis," Zerzura, Owana, or whatever it is called, must exist. Mr. Newbold has apparently misunderstood my papers, and is confusing, perhaps naturally, the place I called the "Egyptian oasis,"* which was reported to contain olive trees, with another I called the "Olive oasis," and consequently thinks that I have altered its position (*G.J.*, 72, 1928, 549). As other travellers will probably go out to look for unknown oases in this part, it may be advisable to make the position clear. My information points to there being two, or perhaps three, unknown places in this part.

(1) The Egyptian oasis: five days north of Merga.†

(2) An oasis eight days by *hagin* somewhere south of Dakhla: It was said to be very large and to contain a number of wells, palms and olive trees, clustered round a large ruined town. But the intelligence was vague and my informant turned out to be unreliable, and too much confidence should not be placed on his information. It was only included in my paper‡ as it seemed to some extent to support the account of "the Egyptian oasis." But if it is a different place, possibly as Mr. Newbold suggests it is Terfawi, though it is more likely to be the "olive oasis."

(3) "The Olive oasis": Except that the above information perhaps confirmed it, this place does not depend upon native information at all, and consequently it was not included in my map and paper on "The Libyan Desert from Native Information" (*G.J.*, September 1913). But I concluded that there must be an oasis near where I placed it from some observations that I made upon birds that migrated into Dakhla in the spring. I estimated it to be ten or eleven days' journey along the road from Dakhla to Owenat. This was apparently the place already referred to that was heard of by Herr Borchardt under the name of Zerzura or Owana.

I find it difficult to agree with Dr. Ball's view that the 375 miles from Dakhla to Owenat could easily be covered in ten or eleven days by Arab trading caravans, especially if they were engaged in the slave trade. A normal day's journey of one of these caravans is about 25 miles, and I have been unable to trace, in any desert of the same arid character, a single stretch of caravan road running without a well for 375 miles—or anything approaching it.

An estimate of the maximum distance that a caravan can traverse between wells can be made from the Government daily ration for camels,§ which in cold weather weighs about 34 lbs. and in the hot season 50 lbs., for food and water alone. The load of a Badawi camel averages about 300 lbs., and he consequently consumes his *whole* load in about five or six days in hot weather and in nine days in the winter season. For a forced march camels require larger rations and are usually more lightly loaded. Badawi camels no doubt are fed on a less liberal scale than those belonging to the Government, but, on the other hand, on an average they are not nearly such fine beasts. Moreover for a trade to be carried on at all they must, in addition to the supplies for themselves, transport baggage and also food, water, etc., for their drivers. The road from Dakhla towards Owenat, so far as I saw it—that is for about 220 miles—contains no

*'Mysteries of the Libyan Desert,' pp. 300, 304, 320, and 321.
†*Ibid.*, pp. 300, 302, 303, and 321.
‡*G.J.*, 42, 1913. The Libyan desert from native information.
§Sudan Almanac, 1912, pp. 72 and 74.

well or any kind of food for camels. The remainder of the journey, so far as is known, is of the same character. If my view that this waterless stretch of 375 miles is too great for a caravan to cover, the only possible conclusion that we can come to is that, at the time this road was in use, there must have been an intermediate well or oasis.

The value of tracks of wild animals—unless they exist in large numbers—as showing the close proximity of water, can, I think, be easily overrated. I found the spoor of a jackal a few miles north of J. el Bayed, in May; and once, when camped at the foot of that hill after a simum had been blowing from the direction of Owenat, a tortoiseshell butterfly fluttered into the camp at sunset. At the foot of a cliff about 70 miles south-south-west of Dakhla I also found the remains of a gazelle. The nearest known places to J. el Bayed are Terfawi, Dakhla, and Owenat, distant respectively about 100, 120 and 220 miles. The jackal may conceivably have come from Terfawi and the gazelle from Dakhla. They may possibly be accounted for by the existence of a totally unsuspected oasis somewhere north-west of Terfawi. But my position for the "Olive oasis" is at about the same distance from J. el Bayed as Terfawi, and may just as likely have been the place from which the jackal came. But the butterfly was flying down wind, and must, I think, have come from either Owenat or the "Olive oasis." Wind-borne specimens of lepidoptera occasionally, I believe, reach England from Holland, about 100 miles away, though the influence of shipping has here to be considered. But Owenat, 220 miles away, can hardly have been the butterfly's last port of call.

Green vegetation is sometimes said to be a sign of water close to the surface, but my experience shows this view to be unreliable. About 15 feet from some green bushes on the plateau to the south-west of Dakhla, I sank a well 30 feet deep, but no sign of water was found. The bushes, I think, must have depended for their existence upon the enormous development of their roots, as the well shaft passed through a mass of roots of all sizes, which extended right down to the bottom of the well.

It has been assumed that Owenat and Arkenu, the two principal places found by Sir Ahmed Hassanein Bey on his memorable journey, are J. en Nari and the oasis on its east shown on Justus Perthes' map of 1892. There are however some strong arguments against this view. These "lost oases" are also shown on the French 1/2 M map published by the *Service Géographique de l'armée* in 1890.

The information upon which these maps are based is the account given by M. Fresnel of a journey made by a famous Arab guide called Shehaymah. But if Shehaymah's route, as described by Fresnel—six days north-north-west from Demi to J. en Nari, and thence five days north-west to Kebabo—be plotted on the map from Demi, it makes Kebabo lie over 200 miles too far to the west from its real position, and an error of this size cannot be due to any minor inaccuracy. The French and German maps do not agree with Fresnel's report, and they differ in some important points from each other. Both however place the well at the eastern foot of J. en Nari, and the oasis due east of the hill. No well has, I believe, yet been found on the eastern side of J. en Nari, and Owenat and Arkenu lie almost north and south of each other instead of east and west.

A further difficulty lies in the difference between the names. A place in the position of Owenat might reasonably be expected to have a Sudanese and a Tibbu name, in addition to one in Arabic. But both Owenat and En Nari are obviously Arabic, and it is curious that a place should have two names in the *same* language. It is perhaps just possible that En Nari is an Arab corruption of the name Anuar that Mr. Newbold states to be that by which Owenat is known to the Bedayat (*G.J.*, 72, 1928, 252). The whole geography of this part, away from the routes that have been actually surveyed, seems still to be extremely vague; but though J. Owenat may be identical with J. en Nari, Arkenu is certainly not the oasis on its east, and Hassanein apparently is consequently entitled to claim it as an entirely new place. It may be worth while for future explorers of that part to make inquiries for J. en Nari.

The gradual reduction of the rainfall in the Libyan Desert to which Dr. Ball refers (*G.J.*, 72, 1928, 252) could hardly be confined to the desert alone, but would probably also extend to the neighbouring districts, including the area to the south-west of the desert, from which Dr. Ball believes the water that supplies the artesian wells in the Egyptian oases is derived. Any falling off of the rainfall in this district would, I think, be bound to affect the flow of wells, and may perhaps account for the desiccation of some of the lost oases, including the "Olive oasis" or Zerzura.

But Dr. Ball states (*G.J.*, 70 (1927), 115) that the water-bearing stratum, into which these artesian wells are sunk, overflows into the Qattara depression. If the lake that he proposes to make here by letting in water from the Mediterranean for his hydro-electric power scheme, should submerge the outfall of the water-bearing stratum to an appreciable depth, it would presumably increase the static head of the wells in the oases. A very slight rise in the level of the static water contours in the oases would make an enormous difference to their prosperity and go far to justify any expenditure required for his great scheme for electrifying Egypt by letting the Mediterranean into the Qattara Depression.

AN EXPLORATION IN THE SOUTH LIBYAN DESERT. By D. NEWBOLD and W. B. K. SHAW (reprinted from 'Sudan Notes and Records,' vol. xi. 1928) 10×6 *inches;* 194 *pages;* 12 *illustrations and* 2 *maps*

As far back as the spring of 1926, the authors of this paper planned an expedition in search of the legendary oasis of Zerzura and the oasis of Merga, as it is called in Egypt and Northern Africa, or Nukheila, or Tura el Bedai, as it is called in the Sudan—neither of which at that time had been found. Merga was found, and partially mapped, in that year by Prince Kemal el Din Hussein and Dr. John Ball. Mr. Newbold and Mr. Shaw, however, did not abandon their journey, but having obtained the necessary Government permission, set out at the end of October 1927 from El Obeid with twenty-eight men and thirty-seven camels. They travelled via Soderi and Hamra el Sheikh to Umm Eidam, and then struck out on a long waterless march of 240 miles to Bir Natrun. Another 70 miles over unknown desert took them to Nukheila (Merga). In this oasis, which covers some 50 square miles, the expedition stayed some days. The place was mapped, a bathymetrical sketch of the lake in the oasis was made and records of the zoology, botany, geology, and antiquities of the depression were taken. Many traces of the visits of Guraan raiders were seen, some of the tracks being quite fresh. Among the relics of their visits to the oasis found was their sacred tree, decorated with portions of a camel sacrificed according to their custom on the commencement of a raid. On leaving Merga the expedition struck out towards the north-east and 17 miles from the lake in Merga discovered a new water-bearing depression that they named Wadi Hussein. In it a small oasis known as Tamr el Qusar, that had been reported to exist in the district, was found. Some 6 miles farther on they discovered another small valley and oasis that they christened Wadi el Aneg. From here, in the hope of finding the rumoured oasis of Zerzura, they set out again towards the north-east on a ten days' journey of 275 miles over an unknown waterless desert, with practically no vegetation. As they advanced, they swung round on a long curve until on reaching the oasis of Selima their route lay almost due east. From Selima the expedition returned to the Nile valley at Saqiyat el Abd.

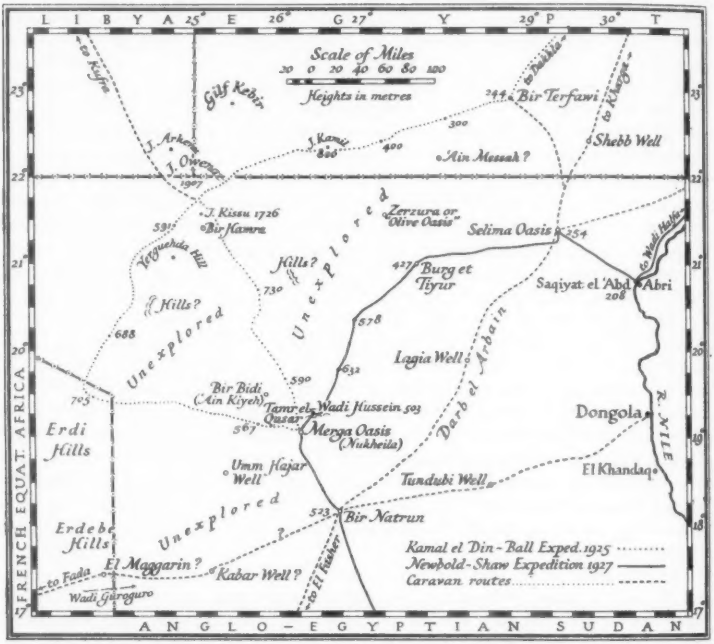
A preliminary account of this journey, with a discussion of the Zerzura problem, was published by Mr. Newbold in *G.J.*, 72, 547–554. The complete account was given in *Sudan Notes and Records*, from which the paper under review is reprinted.

The authors of the narrative portion of this paper have an intimate knowledge of the natives, a sense of humour and a gift of picturesque description. It is to be hoped that, when they have leisure to do so, they will publish a fuller account of their journey in book form. The photographs that have been reproduced are mostly good and well selected to illustrate the text. A route map of the journey, on a scale of 1 : 2,000,000, and a detailed sketch-plan, on the scale of an inch to the mile, of Merga oasis, are given. An unusually careful route traverse was made with prismatic compass and measuring wheel. A 3-inch vernier theodolite and two chronometer watches were used daily between Soderi and Saqiyat el Abd for the 137 star and 34 sun observations that were taken for latitude and for finding the variation of the compass. No observations were taken for longitude owing mainly to the difficulty of rating the watches on such a hurried journey.

The geographical results obtained by the expedition form an important contribution to our knowledge of one of the least-known parts of Africa, though, as is so often the case with a pioneer desert journey, they were not sensational, being largely of a negative character. But an explorer cannot be blamed for failing to find wells and oases if they do not exist, and their absence greatly increases the

difficulty of his journey. The information as to this part of the desert that was collected and the landmarks that were mapped will make the work of future travellers in this part much easier.

The authors jointly contribute an appendix on "Supplies, equipment, water, etc., for men and camels" of a very practical character. This includes a section on the management and endurance of camels. As the authors accomplished a journey of 900 miles—which included two waterless stretches of 240 and 275 miles respectively—without the loss of a single camel and with only two cases of sore back, they are obviously entitled to write with authority on this subject. Other sections are on food and water supply for the personnel of the expedition; on medical stores; on equipment and on clothing, all containing valuable hints



The South Libyan Desert, from Egyptian and Sudan Surveys and from native information

for future travellers in this part. Mr. Newbold contributes an appendix on the cartography and another on the archaeological data collected, which considering the nature of the country traversed were surprisingly plentiful. This, however, he has dealt with more fully in *Antiquity* (September 1928). He is also responsible for an appendix on the oasis of Zerzura, which contains a valuable summary from a variety of sources, including reports of the Sudan Government Intelligence Department and Arab writers, of the available information on Zerzura and other undiscovered oases in this part of the desert. Mr. Shaw contributes an appendix on meteorology; also one on botany, in which a list of forty-one plants is given with their botanical and native (Howawir) names. Notes on the distribution of

the various plants, the amount of grazing for camels, and, in some cases, on the nature of the soil at different places along the expedition's route are also given. There is a preliminary report by Mr. W. H. Bedford on the natural history specimens collected, to which Mr. Newbold contributes a section on bird migration. The notes made upon locusts are of especial interest as showing that this part of the desert is not, as had been feared, likely to be a breeding-ground for these pests. A large number of the specimens had not been identified when the report was published. Over forty geological specimens "with very full notes by Mr. Shaw" were sent to Mr. G. W. Grabham, who contributes the Appendix on geology. From the specimens brought back it seems clear that a much more humid climate formerly prevailed in this part of the desert. Notes on the barometric height estimations made during the journey are contributed by Dr. John Ball. When the route traverse of the expedition came to be plotted a considerable discrepancy was found between the position it gave for the oasis of Selima and that shown on the Government maps. This new position has now been adopted by the Survey Department in Khartoum.

The authors are to be congratulated upon this excellent report on their journey. It is to be hoped that they will follow up the information that they have collected with another expedition. W. J. H. K.

THE PROPOSED ARCTIC EXPEDITION IN THE *GRAF ZEPPELIN*

By the courtesy of the Foreign Office we have received the following Memorandum written by Dr. Fridtjof Nansen to explain the plans of the international society "Aeroarctic" for a series of flights in polar regions during 1930 *with the airship* Graf Zeppelin*: and permission for publication was obtained by the Foreign Office through the Norwegian Legation. Following upon a recent visit from Captain Walther Bruns, Secretary of the organization, the Council had to decide whether they should accept his invitation to our Society to join "Aeroarctic" in a corporate capacity, as several of our Fellows have done individually. After careful consideration the Council resolved that the invitation could not be accepted; but an authoritative statement of the plans will nevertheless be of interest to the Society.*

Memorandum by Dr. Fridtjof Nansen

THE *Aeroarctic* is an international society consisting of scientific members and prominent experts of twenty different nations. Its object is the exploration of the Arctic regions by means of aircraft, *i.e.* to make a methodical use of modern means of transport for the extension of our knowledge of the Arctic regions and their conditions. This extension has become especially important during recent years. Modern meteorology, and especially the Norwegian school of meteorologists headed by Professor V. Bjerknes, have shown that the weather of the whole temperate zone of our Northern Hemisphere is continually influenced by the conditions in the Arctic regions and by the situation of the so-called "Polar-Front." This boundary between the cold Arctic and the warmer southern air-masses determines, by its advance or

retreat, the weather in our latitudes, and by the intrusion of cold polar air the cyclones passing across the Atlantic are formed. It is thus obvious that the conditions in the Arctic regions where the atmosphere of the Northern Hemisphere is chiefly cooled down, has a very great effect upon the daily conditions in our latitudes. Our weather is, so to speak, made up there; but if so, it is clearly of the greatest importance for the forecasting of weather to know at every time the physical conditions in the Arctic regions, and the great programme of the future must therefore be to be able to watch continually the changes of the meteorological conditions in the different parts of the Arctic by means of a net of stations, which can send daily radio-telegrams.

Norway has already years ago established several such stations in the Arctic: two on Spitsbergen, one on Bear Island, and one on Jan Mayen, and there is also now a Norwegian station on the northern east coast of Greenland. These stations have proved to be of very great importance for forecasting weather in Norway. No storms can, for instance, now approach the Norwegian coast suddenly and unexpectedly; there is always time to warn the people, and thus many fishermen's lives have been saved and much loss of boats and valuable equipment has been avoided. But such a net of stations has to be extended over the whole Arctic regions. We also need stations in parts which are difficult to reach, but where aircraft in the future will be convenient means of transport.

The future programme of *Aeroarctic* is, therefore, to help to establish such a continuous service by a net of stations spread over the whole of the Arctic regions. To inaugurate such a new period and to collect the necessary knowledge and experience for planning future work, the Society intends to undertake an expedition with the airship *Graf Zeppelin* across the Arctic next spring. By an agreement between the German Government, the Zeppelin Company, and *Aeroarctic*, the airship is placed at the disposal of the International Society for an expedition in April and May 1930.

The plan is to start with the airship from a last European station in northern Norway (either South-Varanger, Kirkenes, or probably Tromsö) in April next year, to travel across the Arctic regions on the Greenland–American side of the Pole to Fairbanks in Alaska, where a station with mooring-mast, etc., is being prepared. In Fairbanks the airship will be filled up with the necessary gas, etc., and will make a trip back into the inner part of the unknown Arctic towards the Pole and return to Fairbanks. When the ship has then been filled up with gas for a second time, it will start on its homeward journey across the Arctic region on the Siberian side of the Pole, and after having, among other things, surveyed the unknown Nicolas II. Land (or North Land) it will return to its starting station in northern Norway, and then go back to its home in Friedrichshafen. The proposed routes of the airship are between 5200 and 7200 kilometres. The radius of action of the airship is about 12,000 kilometres. Thus there is a good margin.

If this plan can be carried out, the expedition will practically cover the whole of the still unknown parts of the Arctic regions. During the cruises observations of various kinds will be carried out. All little-known or unknown lands and islands will naturally be surveyed and mapped by exact photogrammatic methods. The depths of the sea crossed will be determined by a specially constructed echo-sounding apparatus, which can be used from the ship in the air

without landing on the ice, wherever there is a channel or lane of open water. The apparatus attached to a cable will be lowered into the water, and a sounding will be taken. In this manner it is hoped that the expedition may be able to determine in its main features the extent and shape of the deep Polar Basin, discovered during the *Fram* expedition in 1893–1896, and it may thus be possible to determine the edge of the broad continental shelf surrounding this basin. It is thus to be hoped that the expedition may be able to solve finally the chief geographical problems still remaining in the unknown North. It is also hoped that, especially on the second trip, it may be possible to land on the ice and to take series of deep-sea temperatures and water-samples down to 2000 metres from the eastern unknown depths of the Arctic Basin. But, in addition to this, other observations will be made. It is intended to make investigations of the higher layers of the atmosphere, and especially to determine the height and nature of the boundary between the troposphere and stratosphere. Magnetic observations of importance in these unknown regions will be made; investigations of the electricity of the atmosphere and other observations will also be carried out. Thus an important foundation may be laid for the future methodical scientific exploration of the Arctic regions, but of special importance may probably be the experience gained during this expedition as to the future use of aircraft for scientific research.

The leader of the expedition will be Dr. Fridtjof Nansen, President of the International Society *Aeroarctic*. It is hoped that Dr. Hugo Eckener will be able to take the technical leadership of the airship. The various preparations for the expedition are being carried out under the supervision of special commissions consisting of prominent experts of world fame and of various nationalities, and special instruments are being constructed for the investigations. It has already been mentioned that a special apparatus for echo-sounding is being built, and will be carefully tested before the start of the expedition. Experiments have already been made with magnetic observations on board the airship and have proved very successful. Special magnetic instruments are now being constructed. New inventions of instruments for the observations in the higher parts of the atmosphere are being tried. An apparatus for transferring weather-charts by picture-radio, and a radio-telegraphic long- and short-wave apparatus is being prepared, etc. Emergency equipment with sledges, kayaks, sledge dogs and provisions for ninety days, is being prepared for the possibility that the members of the expedition may have to leave the airship and travel across the ice to land.

For the station in Alaska the American War Office is willing to lend the expedition 5000 steel cylinders for fuel gas (propane), which will have to be transported to Fairbanks after having been filled. The foundations for the mooring-mast will also shortly be made in Fairbanks, where a plant for developing hydrogen will have to be established. In a similar way the station in northern Norway will soon be arranged. A mooring mast will have to be erected there and about 2500 bottles with gas will have to be transferred thither.

A very important point for the expedition is a well-prepared co-operation of the various meteorological radio stations of the various nations in the Arctic. The Norwegian stations have already been mentioned. Very important in this respect is, of course, the wide Arctic region of the Russian Soviet Union. The

Soviet Government has appointed a special Governmental Commission under the leadership of the People's Commissary, Kameneff, and they have promised to equip all meteorological stations on the territory of the Soviet Union north of 60° north latitude with special instruments for the purpose, and to provide the radio-stations at Matochkin-Char, on Great Liakhov Island, and at Sredne-Kolymak with radio apparatus for the navigation of the airship, and also to equip several stations with short-wave and picture-radio apparatus. It is also hoped to obtain the co-operation of the Danish meteorological radio-stations on Iceland and Greenland. Likewise it will be of the greatest importance to secure the co-operation of the meteorological stations in Canada and in Alaska, by arrangement with the Canadian and the American Governments.

By far the chief part of the necessary money for covering the expenses of the expedition has already been secured by an agreement with the Hearst Press in the United States. This sum, in connection with the money obtained for the press news for Continental Europe, will probably cover three-quarters of the total expenses. It turns out, however, that the establishment of the station in Alaska may be attended with quite considerable expenses, but our certain hope is that by means of the sale of the book-right of the expedition, and in other ways, it will be possible to raise the necessary money for covering these expenses too, when it is arranged in as economical a manner as possible.

What has been said above gives a short summary of the plans and the programme of *Aeroarctic*. It may be understood that the object of the expedition with the *Graf Zeppelin* next year, in the preparation of which so many prominent scientists take part, is not merely to fly across the North Polar region and to take a few accidental observations, but it is an important link in a great scientific programme, and will give results of importance for science and for the forecasting of weather in our latitudes, and thereby also for agriculture, shipping, trade, air-traffic, etc. It is hoped that experience will be gained of much importance for Arctic investigations of the future, which will again be of interest to all nations of the cold and temperate zone of the Northern Hemisphere.

SUSSEX. By S. P. B. Mais. *London: Richards* (1929). 7×4 *inches; 272 pages; illustrations and maps.* 6*s*

Of the many recent books on Sussex this by Mr. S. P. B. Mais most resembles that of Mr. S. E. Winbolt. In the matter of format, indeed, it sincerely flatters its predecessor; size and cover, number of pages, type, price, etc., are almost identical. To read Mr. Mais, however, is to be assured that there is room for both of these books. There are nine-and-twenty ways of writing county lays, and very many different minds ask for guidance over our English country. Mr. Mais covers more ground, if more superficially. He is obviously the enthusiast, and equally the journalist who finds a multitude of things which are magnificent, splendid, and superb: one would not wonder if some of his swans were geese. Still, it is an able and useful picture of the county, and should help to persuade Englishmen to see England first.

THE CHARM OF SKYE. By Seton Gordon. *London: Cassell & Co.* 1929. 9×6 *inches;* xii+242 *pages; illustrations and map.* 15*s*

The charm of Skye should by now be amply revealed to those who seek it in print; visitors to the island may safely be left to find it for themselves. Neither descriptively nor pictorially does the present volume add much to recent works, though there is plenty of description of the "silence so intense that it could be felt" order. But the author can mention the hill Preshal Beag without so much as hinting at its wonderful basaltic columns. He evidently cares little for basalt, granite, and gabbro, though these are no mean factors in the charm. He has, however, something to say about the flowers and birds, and devotes a large part of the book to legendary and historical anecdotes. The chapter on the hereditary pipers of Skye will have interest for those able to appreciate this strange music. Our old friend "Pibroch of Donuil Dhu" appears in the fearsome guise of "Piobaireachd Dhomhnaill Duibh." The author pays little regard to the Ordnance Survey place-names; a photograph of the Old Man of Storr is entitled "The Pinnacles of Beinn Stor"—an unnecessary hybrid. Blaven is said in a note to be derived from the Norse "Bla Fjell"; whatever the first half may be, the last must surely be "Bheinn" as in the neighbouring Garbh Bheinn, "fjell" becoming "val" in the Hebrides. Soay is usually interpreted as Sow Island, not Sheep Island, which is the true meaning of Fair (*faer*) Island. The subtitle of the book "The Wingèd Isle " is not explained. J. H. R.

THE COTTAGES OF ENGLAND. By Basil Oliver. *London: B. T. Batsford* 1929. 9×6 *inches;* xxiv+91 *pages; and illustrations.* 21*s*

Those who remember Mr. Basil Oliver's 'Old Houses and Village Buildings in East Anglia' (1912) will be keenly interested to see his selection of old cottages from the whole of England, and will not be disappointed at the rustic feast of beauty spread before them in the 178 photographs, not to mention the numerous drawings, of this most attractive and reasonably priced volume. Every county is represented here, with the exception of the practically Welsh Monmouthshire. We are not surprised to find that the lion's share falls to Gloucestershire; but we should have liked to see the north of England with a larger proportion of illustrations, and would commend to the author's notice some of the Wensleydale villages, such as West Burton, which can hold their own with any in the south. He groups his subjects according to the materials of their construction, and, if we have anything like an adverse criticism to offer, it is that the essential differences in building resulting from different beds of stone, though touched upon in

the text, are hardly sufficiently brought out; the now famous Arlington Row at Bibury could not possibly be in Yorkshire, nor could the cottages near Whitby and Bingley be mistaken for Gloucestershire work. Certainly the rather fanciful geological map is inadequate in this respect, as the whole of the west of England, for instance, is grouped together though containing such strikingly different materials as the New Red Sandstone, the Devonian shales, and the grey granites; while there is no special indication of the Weald, a district which, if entirely covered with chalk, could never have claimed to produce the most picturesque cottages in the country. But this is not to say that the text is anything but highly illuminating. Mr. Oliver is a practising architect—he has recently been awarded the R.I.B.A. bronze medal for Essex, Cambridgeshire, and Hertfordshire—and can point out to the untutored eye the special features that make one building a satisfying object and those that detract from the perfection of another. More than this, he is a well-read antiquarian and gives us delightful quotations from old writers. Every lover of rural England must echo the hope expressed in Mr. Baldwin's Foreword that this book "may fall into the hands of as many as possible of those that have to do with the maintenance, preservation, and erection of cottage buildings." Especially let us commend it to the third group; for it is indeed, to borrow one of Mr. Oliver's quotations, "the Boke for to lerne a man to by wyse in buylding of his house." J. H. R.

OLD RHINELAND THROUGH AN ENGLISHMAN'S EYEGLASS. By E. E. GAWTHORN. *London: Hutchinson & Co. Ltd.* 1929. 9×6 *inches;* 255 *pages; and* 32 *illustrations.* 10*s* 6*d*

Mr. Gawthorn makes no high claim for his book upon the Rhineland: it is a reprint of newspaper articles designed to present "authentic history" and "legendary lore" to the average visitor. Indeed, so disarming is his attitude throughout, that one hesitates to be critical. He devotes many pages to the rather tiresome legendary stories, and then criticizes their intrinsic value: he makes some doubtful statements about architecture, and then professes to be no expert in the subject. His early history is very confused, and difficult to follow. He has, however, realized the important part that the Rhine has played in European history as a thoroughfare in war and peace, and he displays a knowledge of mediaeval life. It is all the more to be regretted that he has obscured this by his discursiveness, and by his style, of which the following is a not unfair example: "He (Richard of Cornwall) was a mere tripper and returned 'fourth class' to England when his money was gone." The illustrations, from the author's own photographs, have been well chosen to give a good general idea of the various aspects of the region. The Appendix gives advice and an itinerary for a rapid trip through the Rhineland.

EAGLES BLACK AND WHITE: THE FIGHT FOR THE SEA. By AUGUR. *London: D. Appleton & Co.* 1929. 7×5 *inches;* 205 *pages; maps.* 5*s*

The birds in question are the black eagle of Prussia and the white eagle of Poland, and the bone of contention is the "Corridor" giving to Poland access to the sea but to Germany a link with East Prussia. It is difficult to see how the aspirations of both parties can be satisfied. The author begs Germany to reconcile herself to the decision of Versailles and to regard Poland as an equal, both countries having everything to gain from co-operation and no hope of a lasting settlement from hostility. He points out that the idea of East Prussia as an island is historically far from novel, and furthermore that the traffic between East Prussia and the Reich, insignificant even before the war, has ample facilities both by sea and land. The Junker commercial magnates are much more concerned with trade from the Slav hinterland than with a territorial union that

is mainly sentimental. On the other hand, the Corridor, which the Poles call Pomorze or the Maritime Province, is absolutely vital to Poland, and, as a matter of fact, is inhabited by a rapidly increasing majority of Slavs. The Kaszub race, to which many of these belong, is closely bound to the Polish by linguistic and religious ties. Various statistics and diagrams emphasize these points; the "American" growth of the port of Gdynia is described and illustrated by a plan. J. H. R.

THE NEW RUSSIA. By DOROTHY THOMPSON. *London: Jonathan Cape* 1929. 9×6 *inches;* xii+330 *pages; illustrations.* 12*s* 6*d*

The map of the U.S.S.R. shows a bewildering number of divisions and subdivisions, most of which are labelled autonomous. We must not therefore suppose that the old Russian Empire has disintegrated. All these separate states have very few rights; the Union is practically supreme, and all the power in the Union is in the hands of a party numbering less than one out of 150 millions of people. Again, the political structure of the Soviet state is highly complicated, and even with the aid of a diagram very difficult to comprehend; but the real power is vested in the Secretariat of the Communist party, the present Secretary-General being Stalin, whose name never appears among the Government officials of the Union. It is observed in this book that the dictatorship of the proletariat is really the dictatorship of a party; we might go further and say that the dictatorship of the party is the dictatorship of its present secretary.

Miss Dorothy Thompson (Mrs. Sinclair Lewis), an American newspaper correspondent, has made a careful study and written a comprehensive account of Russia under the Soviet system. She shows that Leninism is not so much a political doctrine as a religious faith, and that Lenin is its Muhammad. And furthermore, as Soviet Russia is convinced that she will be attacked from outside and will not be safe till the rest of the world shares her beliefs, it is a militant, or at all events a militarist, faith. A point to remember is that a new generation is growing up that has been born in this faith and is allowed to know nothing of the outside world except that it is pagan and must be converted. This at least is the case in the towns. The ideas of individualism, ownership, and inheritance are not so easy to eradicate among the peasants. In fact, the attempt seems to have been given up; successful cultivation of the land forbids the breaking up of the family. We are told that the peasant class has proportionately not more than one-fifth of the representation in the soviets, but that in spite of various forms of restriction and taxation a comparatively rich type of peasant called *Kulak* is coming into being whose existence may bring prosperity to the nation, but not by Communistic methods. It is in the treatment of the *kulaks* and *nepmen* (private traders under the New Economic Policy) that Stalin and Trotsky differ; here lies the crucial problem for Soviet Russia.

These matters and many others of great interest are set forth with lucidity and restraint in this book, which should be read by any one desiring an insight into the working of a momentous and colossal experiment. Students of old Russian will be disgusted at all the portmanteau words, the outbreak of which seems part of the Bolshevik epidemic—*sovnarkom, osoavichim, skrabs*, and the rest—and will make guesses at the meanings of initials like O.G.P.U. and Z.I.K. J. H. R.

THE STRUCTURE OF ASIA. Edited by J. W. GREGORY. *London: Methuen & Co.* 1929. 8½×5 *inches;* xii+227 *pages; illustrations, diagrams and maps.* 15*s*

The title of this volume does not give a very adequate clue to its contents. Rather more than half the book, a total of 119 pages out of 213, including all the folding plates, is devoted to an account of the geology of Western and South-Western

Persia, and is written by Dr. H. de Böckh, Dr. G. M. Lees, and Mr. F. D. S. Richardson. Sir John Cadman and the Directors of the Anglo-Persian Oil Company deserve the sincere thanks of all who are interested in the problems of mountain building, not only for their public spirit in permitting these researches to be published, but also for actively encouraging their publication by financial support. This section of the book introduces a large amount of definitely new and valuable knowledge; but the authors in their concluding section are extremely cautious, and, whilst indicating the general purport of their work, refuse to draw any very definite conclusions.

Of the other contributors to the symposium, Professor F. E. Suess devotes twenty-three pages to an account of his own work on the European Altaids on the grounds that this must of necessity serve as a basis for the study of their lesser-known Asiatic representatives. Professor Mushketov, the Director of the Geological Commission of the Soviet Republics, gives a summary account in nine pages of the East Ferghana and the Altai range; Professor Berkey summarizes in six pages the work of the Central Asiatic Expedition on the structure of the Gobi region; and Professor Barbour deals with the structural evolution of Eastern Asia, basing his paper on the palaeogeographical reconstructions of Professor Grabau. Mr. West's contribution on the North-West Himalaya occupies a page and a half, and Professor Brouwer's, on the East Indies, less than a page. It will be seen, therefore, that the only portion of the book which actually deals with the structure of Asia as a whole is the introductory chapter by the Editor himself, occupying thirty-four pages. Professor Gregory is always stimulating, and his writings are full of suggestion. One cannot help regretting that he did not allow himself a much larger share in the present book, in order to develop his contentions in greater detail.

As Professor Gregory sees the problem of the structure of Asia, there are at the present time two fundamentally different theories. In the first place there is Edouard Suess's interpretation, which conceives the fundamental framework of the continent to be due to the Altaid movements, and in the second there is Argand's interpretation, which views the whole continent as it appears to-day as being the result of the Alpine cycle of earth-movements. Professor Gregory champions the cause of Suess, and he gives a map of the main structure lines of Asia, in which he admits *only* the Zagros, Himalaya, and Nanlin systems and the Arakan arc of Burma as Himalayan–Alpine lines. He considers all the fold belts of the interior of the continent, as well as all the fold-lines in Indo-China, Malaya, the East Indies, and Japan, as Altaids. In this respect he goes much further than did Suess, in that he discards the famous eastern marginal festoons, so generally accepted as belonging to the Alpine movements.

The reader will soon discover that the Editor's views are by no means those of his contributors. Professor Gregory ruthlessly destroys the whole edifice built up by Argand, and he goes so far as to state that " according to Argand's view the whole belt between Arabia and North Persia should have been folded, but its two strongly folded bands are separated by a scarcely folded basin." In fairness to Argand it must be pointed out that he actually gives a section showing this type of structure for Persia, comprising a median block separating two folded belts: a section which is so close to the structure actually found that it is reproduced by Dr. de Böckh in chapter iii, and there referred to as "Argand's admirable synthesis." The reviewer is inclined to think that Professor Gregory has unnecessarily stressed the differences of opinion, whereas there is in reality a very considerable and general agreement on the main points. In this connection, as Professor Suess rightly stresses in chapter ii, Argand for his purpose conceives the Alpine movements as commencing early in Mesozoic times, and "the whole

continent becomes a unity of Alpine movement. It almost flows before our eyes. This conception is in harmony with the observations of Russian and American geologists concerning the recent block movements across the interior from the Primitive Nucleus to the Tibetan Plateau." Professor Gregory, whilst stressing his conception of the Altaid movements, does not definitely date them, though he evidently conceives them as originating in the late Palaeozoic or early Mesozoic and of continuing to exert their influence right on into Tertiary times. As Professor Gregory again reminds us, "Suess's word Altaid is not an extended application of the terms Variscan and Armorican, for it comprises the recent arcs of the Sunda Islands and Japan." In other words, Argand and Gregory seem to be dealing with the same set of movements extending over the same period, but insisting on different names for them. It surely is very difficult to see why Professor Gregory should cut the very clearly marked fold-line which passes through the Arakan Yoma of Burma (which he admits as Alpine) in that of the Andaman and Nicobar Islands, Sumatra and Java, which he insists is Altaid. If the criterion is the existence of a ridge or a fold before the Tertiary period, then the Arakan fold is undoubtedly Altaid, and the central core of metamorphic rocks is far more in evidence there than it is in Java. One may ask, is not the whole solution to the problem to be found in the fact that the building of the continent of Asia, like the building of all other regions of the Earth's surface, has been progressive, and that there is a general tendency for areas folded by early earth-movements to become stable blocks during later periods of orogenesis? Also, broadly speaking, the later movements accentuated some but not all of the earlier folds and expended their greatest energy in developing new folds parallel to the main lines of the earlier movement, and it is rarely that later fold movements cross the earlier lines at right angles. One may be permitted to quote the good example afforded by Wales. No one will deny that the Caledonian movements with their characteristic direction are well marked in North Wales. At the same time the faulting which affects rocks at least as young as the Carboniferous limestone in Anglesey shows that later movements followed the same general lines. As one goes southwards in Wales so there is a general parallelism of trend-lines, but they become younger in date. The Vale of Towy, an anticline, thus involves the Old Red Sandstone, whereas the main folding of the South Wales coalfield, which is broadly parallel to the Caledonian folds slightly to the north-east, is definitely Armorican and post-Carboniferous. Similarly in Asia an excellent example is afforded by Burma. The eastern half of the country was folded into marked north and south folds in Mesozoic times, the youngest rocks involved being probably of Liassic age (Indo-Malayan mountains). There is very little doubt that the comparatively stable block so formed remained a land mass during the deposition of Tertiary rocks in the Burmese Gulf, but the Alpine folds which involve these Tertiary rocks (even the Pliocene) are broadly parallel to the earlier folds which make up the eastern part of the country. The Alpine folds of the London and Hampshire Basins and the Weald are parallel to the Armorican folds of Devon and South Wales, and may even be superimposed on older folds, but surely no one would therefore say that the Isle of Wight monocline is Armorican.

Professor Gregory deserves the congratulation of all geographers and geologists for his energy in collecting together this most important symposium, which cannot be neglected by any serious student of Earth history, and we may hope that Professor Gregory at some time may be induced to work out his own scheme in detail.

L. D S.

WITH PEN AND BRUSH IN EASTERN LANDS WHEN I WAS YOUNG. By Sir VALENTINE CHIROL. *London: Jonathan Cape* 1929. 10×7 *inches;* 202 *pages; and illustrations.* 21*s*

Valentine Chirol has gone, but he has left us an afterglow of charm and interest in Eastern Lands that will give hours of pleasure to many people. It is not easy to say which—his pen or his brush—is most descriptive. Without haste, as befits the East, and with well-ordered mind, the author takes his readers on his travels from Syria and Palestine to Mesopotamia, through India, which he loved and to which he rendered such signal service, and on to China and Japan. Each chapter, with its touch, here of history, there of national custom or religious observance, is complete in itself. The whole hangs together in a manner which shows the master hand and the completeness of the writer's knowledge of his subject. It is a masterpiece of English. Phrases which grip the mind and heart occur over and over again. The humour of many situations is given its just value. The sketches are delightful; that of the Vast Face of Nunga Parbat alone is worth a study of the book. All do not coincide with the letterpress contiguous to them, but that may be passed by.

Sir Valentine adopts from time to time a spelling of the names of places and gods which is unusual. How many must regret the impossibility of a discussion with him on the subject and of hearing the humorous and incisive arguments with which he would have defended his opinions!

It would not be claimed by Sir Valentine that this book is a deep study, but we would say to those who desire hours of real enjoyment, let them get it, and with a map at hand, the lamps lit and the doors shut, transport themselves into the East. W. E. G.

INDIEN UNTER BRITISCHER HERRSCHAFT. By JOSEF HOROVITZ. *Leipzig: B. G. Teubner* 1928. 9×6 *inches;* 136 *pages, and maps. M.*4.80

This short sketch, one of a series of Handbooks of English-American culture, is designed by the author to assist the German public in arriving at an opinion upon the present-day problems of India. The author spent eight years in India, and, as his short bibliographies show, he has an extensive knowledge of the relevant literature. He treats Indian history, including the development of British influence, briefly: the main sections of the book comprise the peoples and their economic condition, education, the struggle for equality of rights, and, finally, Indian unity and freedom. This last section-heading suggests his general point of view, though all readers may not draw the same conclusions from his pages. Many of the obstacles to unity he attributes to the British practice of "divide and govern"; but even when this is fully allowed for, it is difficult to picture the working, in the not too distant future, of his "United States" of India, independent of, but allied to, the British Commonwealth. The general efficiency of British rule he recognizes, though critical of some of its effects. It will be seen that the book deals with the rulers and the comparatively small educated class, rather than with the great mass of the people.

SOME DOCUMENTS RELATING TO THE RISE OF THE DUTCH POWER IN CEYLON, 1602–1670, from the Translations at the India Office. Edited by P. E. PIERIS. *Colombo: C. A. C. Press* 1929. 10×6 *inches;* xxxvi +292 *pages*

The learned editor of this volume of documents has already dealt at great length with this period in two earlier works, 'Ceylon, The Portuguese Era,' and 'Ceylon and the Hollanders,' whilst the Portuguese documents in the Lisbon archives were published a few months ago by Fraülein Fitzler. On the Dutch side, the

works of de Geer and Aalbers have told us most of what we want to know, and Heer S. P. L'Honoré Naber's edition of Gijsbert Heecq's voyage has given us further details. On the whole, it is difficult to see what interest is served by the publication of this book, especially in its present form. The introduction is good so far as it goes, but amounts to little less than a précis of Dr. Pieris' monumental earlier works, to which the student will always turn in preference to the present. The documents here reproduced are interlarded in the text between a sort of rambling commentary and odd jottings by the editor, so that it is very difficult—at times impossible—to tell where the one ends and the other begins. The actual translations themselves leave a good deal to be desired, though the reviewer knows from bitter experience of the originals that a really satisfactory rendering is almost impossible. Still there is no excuse for rendering the Dutch word for shore "*wal*" as *wall* (p. 172), or writing of the captains *fastening* (i.e. *anchoring*) their ships (p. 99). Misprints are unduly numerous, and detract largely from the value of a work of this kind. Many of the proper names are obviously distorted forms, and no attempt is made to check them, as could easily have been done from the writer's other works. With regard to the actual matter in the book, although it adds nothing new of importance to what is already known, it does bring out very clearly the utter falsity and bad faith of both the Dutch and Portuguese in their dealing with Raja Sinha II and the Sinhalese. No impartial reader can peruse the unctuous phraseology of both the Calvinistic Dutch and the Catholic Portuguese Letters without revulsion, for in the same letters in which the writers piously invoke God's help and blessing on their enterprises, they make the most barefaced and downright proposals of treachery in their dealings with the natives.

Nevertheless, when all is said and done, the rise and establishment of Dutch power in Ceylon was an inestimable boon for the island. Under the Portuguese, ceaseless wars had reduced the island to a place where not only man was vile but every prospect laid desolate and waste. Even if the Dutch obtained power "by methods which would have disgraced a village attorney," they at least brought peace eventually, and eighteenth-century travellers are unanimous in their praise of the pitch of prosperity and fertility to which the island had been brought under Dutch rule. This of course was a later development, but Dr. Pieris would have done well to have told us in his book more about men such as Adriaen Roothaes and Pieter de Bitter, or even Rijckloff van Goens, than sea-lawyers of the type of Borreel and Maetsuycker. In conclusion, it must be said that this book is emphatically of little use to the general reader, but is of undoubted value to the student who already has a fair working knowledge of the history of the Dutch in Ceylon and of the sources therefor. C. R. B.

TWENTY YEARS AMONG PRIMITIVE PAPUANS. By WILLIAM E. BROMILOW. *London: The Epworth Press* (*J. Alfred Sharp*) 1929. 8×5 *inches; 316 pages; and illustrations.* 5*s*

In 1888 the Methodist Mission was allotted a specific area in Papua for missionary endeavour, and the little island of Dobu, in the d'Entrecastreaux group, was selected as its headquarters. Thither, as Chairman of the Mission, went Dr. (then Mr.) Bromilow with his wife and young daughter. The Dobuans were then the most inveterate cannibals in Papua, even roasting their victims alive. Sir William Macgregor described them as "the most murderous of all the inhabitants of the Possession." Among the women chastity was almost unknown, sorcery was rife, and the custom of burying a living child with its dead mother was still practised. Against all this, as well as the open hostility of the islanders, the missionaries had to contend, and this book, written with modest and com-

pelling sincerity, is the record of how the mission won through its difficulties to definite success. Dr. and Mrs. Bromilow's work has been such that even those who have scant sympathy with foreign missions will be unlikely to withhold their admiration for the devotion it displays. To Mrs. Bromilow belongs the credit of first breaking down the custom of infanticide by adopting a child which was on the point of being consigned to a living grave; from this sprang her Children's Home, which in turn developed into the extensive Training Institute now in being at Salamo; while the crowning achievement of Dr. Bromilow's life-work was the translation of the Bible into Dobuan. His record serves to show that, when the right teachers are found, Christianity can, as the late Dr. Rivers maintained, give a primitive race an interest in life to replace their indigenous religion, and besides its personal aspect the book gives much valuable information about the culture and mental processes of a little-known people. O. R.

THE RACES OF JAVA: A few Remarks towards the Acquisition of some Preliminary Knowledge concerning the Influence of Geographic Invironment on the Physical Structure of the Javanese. By D. J. H. NYÈSSEN. *Weltevreden, D.E.I.: G. Kolff & Co.* 1929. 11×7 *inches;* viii+122 *pages; illustrations and maps*

This is one of the publications which the Netherlands Indies Committee for Scientific Research, in conjunction with the Department of Education, is doing such excellent work in sponsoring. It is particularly welcome to anthropologists because hitherto no serious examinations on an extensive scale have been carried out in Java. Dr. Nyèssen hopes to indicate racial connections by a study of geographic forces and has two instructive chapters on Java in its anthropobiological environment, and on immigration and internal migration. The bases selected for detailed study were the mountain district of South Priangan for Western Java, the limestone hills of the Sultanates for Central Java, and the park-like country of Madura for East Java. This book is but a preliminary report on the results obtained, but it contains much information of value to scientists, and is illustrated by sketches of racial types; an index and a full bibliography are appended.

O. R.

FOUR FACES OF SIVA: The Detective Story of a Vanished Race. By ROBERT J. CASEY. *London: George G. Harrap & Co.* 1929. 9×6 *inches;* 270 *pages; illustrations and sketch-maps.* 12*s* 6*d*

There is room for a good book on Angkor. We cannot justly call Mr. Casey's book a bad one, but it is disappointing because with a little more trouble and attention he might have made it very much better than it is. The title is taken from the four faces of Siva which adorn the towers of the Bayon and the Gate of Victory at Angkor, where Mr. Casey apparently spent some time, although he does not tell us how much. He describes the ruins in considerable detail, gives an outline of their history and retails legends and traditions connected with them; and his book is illustrated with a series of excellent photographs. He does not profess to write for the student or the scientist, but even an author who is writing for popular consumption is not excused from revealing the source of his quotations. Mr. Casey owes much to those who have studied Angkor before him, particularly to the French archaeologists Groslier and Aymonier, but he fails to give references; he is silent as to the origin of his photographs and diagrams, nor has he thought fit to provide an index or a bibliography. The style in which he writes is as likely to irritate lay readers as scientists, and his flowery sub-titles (such as "The Khmers walk into the Great Silence") become fatiguing. His visit ended in his discovering what he took to be a hitherto

unknown "hidden city"; but he was unable to remain in its proximity longer than a few hours, since he had set out to look for it (by motor) without food, water or camping outfit. We cannot help feeling that the ruined cities of the Khmers are entitled to more respect. O. R.

EAST FOR PLEASURE: The Narrative of Eight Months' Travel in Burma, Siam, the Netherlands East Indies and French Indo-China. By WALTER B. HARRIS. *London: Edward Arnold & Co.* 1929. 9×6 *inches;* xii+399 *pages; illustrations and map.* 21*s*

This is a far more serious work than its title suggests; but that is not to say that it lacks readability, for Mr. Harris is too experienced a journalist not to be able to write entertainingly on any subject he thinks fit to choose; nor is he less experienced as a traveller, for he went East, as he suggests others should go, forgetting racial prejudices and with a full measure of consideration, comprehension, and good humour.

His itinerary during this eight months' trip was through Burma as far north as Bhamo, from Moulmein to Penang and Bangkok; thence, via Singapore, to Java; and later he spent several weeks cruising among the lesser-known islands of the Dutch East Indies, particularly Bali, Celebes, and the Moluccas, and finally made a tour of French Indo-China, visiting Saigon, Angkor, and Hué, the capital of Annam. He thus had the opportunity of observing the conditions under which the three great colonizing Powers in the Far East—Great Britain, Holland and France—are administering their colonial possessions. Knowing what to look for, he made the best use of his time, and the result is that rare thing, a really delightful modern book of travel. Mr. Harris varies personal experience with description, both of people and of places, and description with sagacious comments on political, educational, and economic affairs. He can be amusing and serious by turn, and the thoughtful reader will find his reflections on the awakening spirit of Nationalism among the peoples of the Far East both shrewd and stimulating. All three of the colonizing Powers are faced with problems which differ only in degree. The peoples whose wardenship they assumed are now demanding what they believe to be their due. Mr. Harris is not one of those who see the finger of the Soviet Government in such demands, and his remarks on the existing situation and the manner in which it may be met merit the attention of every one who is interested in the future of the Far East.
O. R.

OLDEN TIMES IN ZULULAND AND NATAL, containing earlier political history of the Eastern Nguni Clans. The Rev. A. T. BRYANT. *London: Longmans, Green & Co.* 1929. 9×6 *inches;* xx+710 *pages; illustrations and maps.* 12*s* 6*d*

Mr. Bryant has accomplished a big task—the setting down of "the earliest known political history" of the Bantu clans of Zululand and Natal and some adjacent regions. His qualifications for the work include forty-five years spent in missionary, educational, and literary work "among the raw natives," and he can weigh evidence judicially. Appointed Lecturer and Research Fellow of the Witwatersrand University, the publication of his book, it appears, has been made possible by the help of the Union Government—an eleventh-hour recognition of the importance of the subject. Besides making a diligent study of the old records, Mr. Bryant has gained much valuable information from the natives themselves, and there is justification for his claim that upon his work all future "Zulu" history must be based.

Though in a few cases genealogies may be traced to the sixteenth century,

native recollection of tribal history does not normally go back beyond the beginning of the eighteenth century. Mr. Bryant tells in detail the history of the scores of Nguni (or Zulu-Xosa) clans from about that time up to 1828, the date of the murder of Shaka (Chaka), with a brief "afterclap" tracing the history of the Zulu royal family to the present day. It is a long and involved story, which the author has sought to enliven by a style which may be called colloquial, and with quotations from the poets. This style may displease the reader, but the author frequently succeeds in gripping attention. The chapters dealing with the first British settlers in Natal are distinctly entertaining—and instructive. The author's painstaking patience compels admiration. On one of his maps he has given the location of all the 160 different clans in Zululand and Natal in "pre-Shakan" days.

The use of Nguni as the general name for the people described in the book is not common, but it is more comprehensive than Zulu-Xosa, and is justified by ancient native usage: the clans all trace or traced descent from the Nguni tribal family, which penetrated to its present domain 500 to 400 years ago.

There are passages in Mr. Bryant's book which give rise to speculation and doubt; nevertheless, every student of the ethnology and history of the South African natives will be glad to have the results of his self-imposed labours.

F. R. C.

MY PEOPLE THE SIOUX. By LUTHER STANDING BEAR. *London: Williams & Norgate* 1928. 9×6 *inches;* 288 *pages; illustrations.* 15*s*

Any one who takes a sympathetic interest in the American Indian should read this very pleasant book by Chief Standing Bear. Born in 1868, at the dawn of the period when the Sioux people were to suffer so much from the encroachments of the white man, he gives an interesting account of the education of a young Indian at that time, and of the life of the Sioux before all their old customs were swept away. Family life in the Tipi, games, buffalo-hunting, etc., are described. The author was one of the first batch of Indians to be educated at Carlisle, Pennsylvania, and gives an account of his life there. His subsequent career was very varied, as he has been schoolmaster, storekeeper, rancher, clerk, and interpreter for Buffalo Bill for his celebrated Wild West Show on one of its tours round England. On his journey to New York the following year to accompany Colonel Cody again the Indians met with a railway accident, and Standing Bear was so badly injured that he could not proceed. Since then he has continued his varied career by acting for the films, and is now living in Los Angeles. The book contains some excellent illustrations of Indians.

THE ROAD TO OREGON; a Chronicle of the Great Emigrant Trail. By W. J. GHENT. *London: Longmans, Green & Co.* 1929. 10×6 *inches;* xvi+274 *pages; illustrations and map.* 21*s*

No adequate history of the early trails across the western United States has yet been written. In 1848 Francis Parkman wrote 'The Oregon Trail,' a book which is still widely read, but is in no sense a history of the route. Mr. W. J. Ghent has written a useful account of the longest and most famous of the American trails. The book is a comprehensive summary of the discoveries of the trappers and missionaries, the great emigrations to Oregon and California, the Mormon emigration, the gold rush, the stage-coach period, and the general decline of the importance of the road, which accompanied the construction of the railways. For the geographer, chapters vi and vii are the most interesting part of the book. The former is a description of life on the trail, and the latter is a detailed account of the route. It is to be regretted that more space has not been allotted

to these chapters, but the author is inclined to neglect the importance of geographical factors in determining the course of the trail. Mr. Ghent has made a judicious use of the mass of material which exists in the diaries of trappers, missionaries, and emigrants. The book is well documented, contains some interesting illustrations and a map of the trail and its branches. E. W. G.

CLAYS: their Occurrence, Properties and Uses, with especial reference to those of the United States and Canada. By HEINRICH RIES. Revised and enlarged, third edition. *New York: John Wiley & Sons, Inc.* 1927. 9×6 *inches;* viii+614 *pages; illustrations, diagrams and maps.* 35*s*

The first edition of this work appeared in 1906, and was followed by the second after a short interval in 1908. In the nineteen years which elapsed between the second and third editions an immense amount of research was carried out, especially into the physical and chemical constitution of clays. The author refers modestly to his efforts to digest this vast literature and to incorporate the results, but a comparison between the second and third editions shows how thoroughly the work has been done. The book has increased in size from 554 pages to 614, despite certain omissions. The expansion includes a new chapter on Canadian clays, but is seen mainly in the chapters on the physical, mineralogical, and chemical constitution of clays. The omission of the inadequate section on mining and manufacture is wise: the book must be ranked now as a standard and indispensable work on the scientific study of clays, and is thus complementary to such books as those of Searle, which stress the economic and industrial aspects.

L. D. S.

CLIMATE: A Handbook for Business Men, Students and Travellers. By C. E. P. BROOKS. *London: Ernest Benn* 1929. 9×6 *inches;* 200 *pages; diagram and two maps.* 10*s* 6*d*

This book is a summary of the distribution of climates over the surface of the Earth. Since it consists of highly compressed material, the treatment has of necessity been statistical rather than descriptive, and at the end of each chapter there are tables giving for a number of stations in the several regions dealt with the mean temperature (°F.) and rainfall (inches), with extremes of temperature in the different months of the year, as also mean relative humidities and cloud amount for January and July, and mean number of days in the year with rain, snow, and thunder. There is no discussion of the geographical factors which govern climate, and for this the reader is referred to 'The Weather,' by the same author, appearing in Benn's Sixpenny Series.

In an Introductory chapter there are two maps showing the average distribution of pressure (millibars) over the globe in January and July, and a diagram of the annual variation of temperature and rainfall at Kew. Some readers may cavil at the paucity of diagrams, but others will find it a relief to alight upon a book that is not overburdened with figures that are frequently badly lettered, and quite unnecessary for the purpose of visualizing seasonal variations. Then follow six chapters, suitably subdivided, treating respectively of the North Temperate Regions, Mediterranean Climates, North Tropical Climates, Equatorial Climates, Sub-Tropical and Temperate Climates of the Southern Hemisphere, and the Polar Regions. Throughout these chapters there is perhaps too much emphasis on the relative humidity, an emphasis which appears to rest, according to a statement in the Introduction, on the rather doubtful premiss that this measure gives the "feel" of the air. Actually the "feel" of the atmosphere is a complex of temperature, wind, moisture, sunshine, and probably electricity, and so far as the humidity-element is concerned it is the absolute measure (vapour pressure) that

is more important in our bodily sensations than the percentage of saturation, except when this reaches 100 per cent. with fog.

The few defects of this book are such as proceed from a somewhat too statistical outlook and from a failure here and there to make that careful selection of words which is so necessary in a condensed discussion of a many-sided subject like climate. It would be unfair to be minutely critical of what is certain to prove a most useful work, but the following points might be worth the author's consideration for a future edition.

The statement that in the Mediterranean the continuously overcast but dry days common in North-West Furope are *unknown* is altogether too theoretical. The statement that in the Scilly Isles snow *never* lies would be better if read never lies *long*. The further statement that in October and April snow in the British Isles is "rare" can only—at least as regards April—be looked upon as a slip. It is incorrect even in the south, while in the north it is not until past mid-May that there can be any assurance that sleet and snow are not lurking round the corner! Finally, we may refer to a sentence to the effect that the seasons in the British Islands are only slightly accentuated and that all through the year days occur that might belong to any month. Even if this be true in the limited thermal sense that is no doubt intended, the statement might surely have been qualified, especially in a book that will make its way round the World, by some appreciation of the impressive contrast, in these high latitudes, between the solstices as regard light and darkness and all the atmospheric effects associated therewith. All such seasonal effects of light and shade are as much part of climate as are conditions of temperature and rainfall; but though they are often vividly described by our men of letters it is rare to find them even incidentally referred to, let alone described or discussed, in professedly climatological works. L. C. W. B.

THE WORLD'S GRASSES: their Differentiation, Distribution, Economics and Ecology. By J. W. Bews. *London: Longmans, Green & Co.* 1929. 9×6 *inches;* x+408 *pages; and illustrations.* 21*s*

To the geographer the grasses and the communities they form cannot but be of the greatest interest, since members of this group not only supply directly all the most important of the World's cereals, but grass communities furnish the staple diet of the animals which are utilized by man, and of most other herbivores. Further, the group is one of the largest families of flowering plants, comprising over 5800 species belonging to nearly 500 genera, the members of which are found in almost all regions of the globe in almost every conceivable type of habitat.

The distribution of grasslands in historic and prehistoric times has played a profound part in determining the distribution and activities of man. The geographer and ecologist are therefore alike deeply interested in the antiquity of such communities, whether primitive or the consequence of man's activities. Prof. Bews, in the present work, expresses the view that "the great grassland areas of the world are none of them primitive," a statement which appears much too sweeping, and is certainly at variance with palaeozoological evidence. It can be granted that the tropical grass (Savannah) area has been greatly extended by repeated fires, and that a considerable area of the present American prairies were formerly forest, that the regions of grassland and semi-grassland in Africa probably occupy a much larger area than in prehistoric times but this is far from proving that no such areas existed primitively. Indeed, the occurrence of fossil remains of a graminiverous fauna on the American prairies sufficiently refutes the suggestion that these grasslands are of recent origin or the consequence only of man's activities.

The author's treatment of the subject is considerably influenced by his views on the phylogenetic history of the group, views that are developed in the first two chapters, which deal with the structure and differentiation of the many tribes. A key to the tribes and genera is followed by notes on each genus respecting the distribution, ecology, and economic status of its species.

The sections which will chiefly interest the geographer are those dealing with the general ecology and economic applications. The text contains a considerable mass of information which must have involved no small labour in its compilation, and there is also a copious bibliography. E. J. S.

SESQUICENTENNIAL CELEBRATION OF CAPTAIN COOK'S DISCOVERY OF HAWAII (1778–1928). By ALBERT P. TAYLOR. *Honolulu: Sesquicentennial Commission and Archives of Hawaii Commission* 1929. 11×7 *inches;* vii+106 *pages; and illustrations*

This is a detailed record of the varied ceremonies held at Hawaii to commemorate the 150th anniversary of its discovery by Captain Cook. The project, initiated by the Hawaiian Historical Society, was the subject of a special Act of the Legislature of the Territory, and of a resolution of Congress. The President of the United States was represented by Mr. D. F. Davis, Secretary of War, and American, British, and Australian battleships took part. A special memorial coin was struck, and a series of surcharged postage stamps issued. The principal events were the dedication of a monument recording Cook's landing at Waimea, Kanai, and of a plate, partly submerged, marking the spot on the shore of Kealakekua Bay, where he was killed, and the performance of a historical play, 'Hawaii 150 years ago.' The numerous "literary exercises," reprinted herein and including the British Naval Historian's address (printed in the *Journal*, 73, 97), covered most aspects of Cook's connection with Hawaii, and the relations of the islands with the outside world. It is perhaps only natural that the latter subject seems to have predominated. Much miscellaneous information about Cook appears in an appendix: separated from the social functions. The book is fully illustrated.

HISTORIA DO DESCOBRIMENTO E CONQUISTA DA INDIA PELOS PORTUGUESES. By LOPES DE CASTANHEDA. Thirty-one chapters of the lost "Livro IX" rediscovered and now published for the first time by C. WESSELS. *The Hague: Martinus Nijhoff* 1929. 10×6 *inches;* xii+76 *pages; and facsimiles.* 6 *Gld.*

The loss of the ninth and tenth books of Castanheda's history has always been regretted by students of the annals of the Portuguese in the East, because he is perhaps the best authority, more reliable than Correa, fuller than Barros, though he lacks the anecdotes and vitality of the first and the style of the second. The printing of these books was forbidden for reasons of which we are ignorant, but perhaps on account of the author's frankness in regard to persons and events in one or more of the previous books. For the same reason Goes had to withdraw the first volume of his Chronicle of King Manoel, Barros only saved himself by caution and by omitting reference to the disputes between the *conquistadores*, while Correa left his 'Lendas da India' unpublished.

The chapters now printed by Father Wessels were copied by Father Maffei, the Italian Jesuit who wrote in Latin a history of the Portuguese in the East by order of Cardinal Henrique, the last native King of Portugal previous to the union with Spain; the copy exists in the Archives of the Society of Jesus, and two pages are given in facsimile here. The chapters are said to follow on the eighth book with a break of about a year, but they are evidently not in their original

order, nor do they present a complete narrative of the period they are supposed to cover (1539–1542); nothing is said of the chief event in the short rule of D. Estevam da Gama, his expedition to the Red Sea in 1541, which Castanheda could scarcely have failed to describe. Moreover, it is doubtful if some of them, in view of their brevity, have the full text of the original.

Nevertheless they are welcome, and Father Wessels has done a good service by his discovery and careful transcription; the latter must have been no easy task. We are glad to possess further testimony to the influence enjoyed by Antonio Galvão in the Moluccas, to his success in spreading Christianity in the best way, by high example, and to the love he inspired in the natives, both kings and people. When converts of rank lost their property and pensions by embracing the Christian Faith, he supplied their needs out of his own purse, "because the King of Portugal had no merchandize in the factory." His own officials disliked him because he prevented them from trading in spices, and he was driven from his post; he left the Portuguese at peace with the natives over 400 leagues of sea and island, which had never happened before, while six rulers had become Christians. From a note of Lavanha to the sixth decad of Barros we learn that he spent 10,000 *cruzados* of his own on the fortress of Ternate and for other public ends, and returned home in debt, yet so far from receiving any reward from the king for his unique services, he was obliged to pass the remaining seventeen years of life in hospital, supported by friends.

In the account of the prolonged siege of Baçain, Castanheda relates in a stirring chapter the defence of a solitary blockhouse by one Pero Velho and three companions against a host of Moors; the exploits of common soldiers, equally with those of their leaders, such as Duarte Pacheco and Antonio da Silveira, are part of the epic story and explain how the Portuguese, with scanty resources, gained their dominion and held it for a century and a half. The campaign against Baçain lasted two years and Ruy Lourenço de Tavora, captain of the fortress, spent all he had upon it, returning to Portugal a poor man.

The chapters conclude with the arrival of Martin Afonso de Sousa, whose bravery, prudence, and charity to prisoners are mentioned. They do not contain anything which could provoke the censor, unless it be the exposure of the misconduct of Jorge de Castro, who succeeded Galvão; perhaps this fact accounts for their survival, and one fears that the rest of book ix and the whole of book x may have been destroyed. Had they existed when Father Maffei made his transcripts, he would surely have included parts of them. The statement at the head of p. 10 of the Introduction should have been explained; it is tantalizing to be referred to an article written in a language not generally known, and we must remark that the phrase "hibernation on Mozambique" applied to Martin Afonso de Sousa is not correct English. In punctuation Father Wessels appears to have followed the transcript; but it is so defective in this respect that the text often needs study to be intelligible. As he was dealing with a copy only he would in our opinion have been wise to punctuate it fully. A similar criticism might be directed against the new edition of Castanheda, now being issued by the Coimbra University Press, but there the punctuation is not only inadequate, but erroneous, at least according to our ideas. Father Wessel's publishers deserve thanks for the handsome manner in which they have produced the volume. E. P.

THE NEW WORLD. Problems in Political Geography. By ISAIAH BOWMAN. 4th Edition. 1929

Since the first edition of this work appeared in 1921 there have been two reprints with modifications and additions; but for this fourth edition the work has been largely rewritten. The supplements are now merged in the body of the work, and

there has been a considerable expansion. Space gained by the omission of the 65 picture illustrations of the first edition has been absorbed mainly by including 257 maps in place of the former 215, of which some are omitted and many redrawn. The book has increased from 632 to 803 pages. This increase is due partly to the addition of two new chapters—iii, The Mohammedan World, and xxxv, The Situation of the U.S.A.—and partly to the expansion of others. Chapter i. is trebled in length and wholly recast; the chapters on Imperial Britain, on Germany, and on France are expanded by one-half. Elsewhere there is some condensation in the treatment of the new states of Europe. There is also some regrouping, in which it is interesting to note that the 1921 grouping of Holland with the Scandinavian countries—as neutral states—has given way to a more geographical grouping of Holland with Belgium. The bibliography has been nearly doubled, and now occupies 29 pages in small type and forms a remarkably comprehensive and valuable reference for all students of present-day political geography: its expansion is generally proportional to that of the main text, but we may note that the section referring to the British Empire is more than doubled.

In his opening chapter Dr. Bowman treats of some major problems in their world relations as a preliminary to the treatment by politico-geographical units or groups followed in the rest of the work. These major problems are mainly European, for that continent contains half the independent sovereign states of the world and is perhaps the most complicated area of political geography. The section on International Relations describes the League of Nations as "the greatest world power in history in the regulation of international affairs . . . If it did not exist, the world would devise something like it." This first chapter is essentially introductory and succeeds in presenting useful outlines of the main facts regarding Mandates, Minorities, Debts and Reparations.

The great increase in the space devoted to the problems of the British Empire is chiefly due to the addition of sections on Canada and Newfoundland, which were barely mentioned in the first edition. There is a clear sketch of the geography of Canada which emphasizes its close economic relations to the United States, and an attempt to estimate the strength of Canadian nationalism and loyalism, concluding with the statement that "Canadians as a whole look upon their place within the British Empire as a much more important asset than union with the United States could be." The problems raised by actual or attempted immigration from Asia into the English-speaking lands round the Pacific have produced very similar reactions in British Columbia, California, and Australia, and the Governments in Ottawa, Washington, and London must needs take account of this unanimity. The sections devoted to the British colonies and to India have been revised and brought well up to date. The West Indies are discussed in their relations to Canada, as well as to Great Britain, and to the Caribbean region, in which the U.S. has special interests.

In the first edition of this book the Muhammadan World was discussed briefly in its relations to European colonizing Powers, especially Britain. Here it is given a special chapter in which the outstanding feature is a set of six coloured maps showing the extent, total population, Muhammadan population in total and as a proportion of the whole, rainfall, drainage, and railway development in the region. The text is a brief statement of the recent history of the Moslems, a comment on these maps, and a statement, partly statistical, of the chief natural resources, which leads to the conclusion that there is no real base for any Muhammadan Power which could seriously threaten Europe, even in the improbable event of union of forces among the Moslems. On the other hand, civilized control of these lands is severely limited by desert conditions, and should be only a marginal control directed towards suppressing the slave trade and the raiding of settled

peoples. The development of air power has greatly lessened the difficulty of maintaining such a marginal control, and it is now effective round most of Arabia and the Sahara.

It is not possible to discuss the author's treatment of all the world, and we turn to his last chapter on The Situation of the United States. This was published in 1923 as a supplement to the first edition: it is here revised but not substantially changed. There are concise statements of the main facts of the Immigration and Negro problems. The facts that the negro here is a small minority of the total population, though a majority in the Black Belt, and that he has no tribal organization or native language, differentiate the problem from that of South Africa. The "sections" or groups of states which have common interests and tend to act in unison are of considerable interest. They are hardly more than mentioned, and it is not easy to estimate the relative force of sectionalist and unionist tendencies. Such sectionalisms are present in all countries: in the U.S.A. they are emphasized by the mere size of the land. Perhaps the differences of "New England" and the "Old South" from one another and from California may be likened to those between England, South Africa, and Australia, though there are obvious contrasts between the relative geographical locations. The discussion of the Foreign Relations emphasizes the fact that Canada is the principal neighbour, and that the United States import more from Canada than from any other country. If to this we add that Great Britain comes second in the United States trade and that Australia and India are of considerable importance, it becomes clear that in practically every respect the British Empire is the most important external Power for the United States.

The imperialist expansion of the United States since 1898, mainly to the southward, but also in the Pacific, is clearly summarized, with an account of the extent and political organization of their overseas empire, and their relations to the Latin-American republics. This leads to a discussion of the ways in which the growth of the United States themselves in population and wealth has led to the growth of their economic interests in other lands, and so brought them into world politics and relations. Perhaps we may suggest that an assimilation of the Monroe Doctrine for Latin America with that of the Open Door for China would lessen the possibilities of friction in the Americas which arise from some interpretations of the former doctrine.

In regard to both the English-speaking Powers there is a difficulty of nomenclature, arising naturally from their development, which may cause difficulties. The adjective "British" may refer to the British Empire as a whole, or to some parts of it, or to the British Isles, or to Great Britain only, and it is not always easy to know which is meant. In particular, the author frequently uses the terms "English" and "British" as interchangeable. In a similar way it is sometimes necessary to judge from the context whether "American" refers only to the U.S.A. or to the continent as a whole. The U.S.A. have been described as a country without a name, since neither part of that name is peculiar to it.

It is natural for a review in this *Journal* to concentrate attention on those sections of the book which touch British interests more closely. But other lands have been dealt with as carefully, if not as fully. Yet the problems which affect the two English-speaking Powers appear to have been most prominent in the author's mind. They include most of the important world problems: though the Soviet Union and China are much less fully treated. There is no account of the reorganization, which is perhaps mainly on paper, of Inner Mongolia resulting from Chinese migration to it in the present century. In nearly all cases the author has been content to state, as precisely and fully as possible and with the aid of clear diagrams, the chief measurable factors which bear on the problems of political

geography which form his theme. The statement is objective, impartial, and comprehensive, and by it he has rendered valuable service to the world. The book is one to be consulted by every serious student of world affairs. C. B. F.

ENIGMAS: another Book of Unexplained Facts. By Lieut.-Commander R. T. GOULD. *London: Philip Allan & Co.* 1929. 9×6 *inches; 320 pages; illustrations and sketch-maps.* 12*s* 6*d*

Lieut.-Com. Gould has followed his volume on 'Oddities' (see *Journal*, 73, p. 88) with another in similar strain but slightly different scope. Three of his enigmas are geographical, the landfall of Columbus (already printed in the *Journal*, May 1927), the Strait of Anian, and New South Greenland. Other essays deal with giants, longevity, the alchemists, the canals of Mars, and a few other topics. If the geographical essays are the only ones to be noticed here it is not because the others lack in interest. It would be difficult to find a book of wider appeal, since Com. Gould adds to a faculty of clear exposition a style in which wit and invective find their place.

In discussing the landfall of Columbus Com. Gould concludes that as far as the available data admit of any definite solution Guanahani, which was Columbus' San Salvador, is the modern Watling's Island of the Bahamas. The Strait of Anian is believed to have been named by Corte Real, and after his day became a vague name for a sea-link between Atlantic and Pacific. Mercator's and other maps located it in approximately the position of Bering Strait, although no one with certainty traversed that strait before Deshnev in 1648. Much of this essay turns on Maldonado's voyage of 1588. His original manuscript has been lost, but a copy was found in Madrid and published in 1812. If it is true, it records a remarkable voyage from Hudson Strait to the Pacific and back again in the same season. It may be a romance, but the difficulty in dismissing it as such lies in its close agreement with facts which were unknown at that time. Com. Gould has charted the voyage on a modern chart, by Fox Channel, Regent Inlet, Melville Sound and Bering Strait. It fits in quite well. Maldonado may have been an impostor. If so, his guesses were lucky hits. He may have done something of which he could give no clear account. Com. Gould has to leave the question open.

Benjamin Morrell has come in for his share of abuse over New South Greenland. Dr. W. S. Bruce, perhaps largely out of sympathy for a man who he felt was not a sheer impostor, defended him too staunchly. Com. Gould treats Morrell fairly and inclines to the belief that his New South Greenland was really the eastern or Foyn coast of Graham Land. There are difficulties in accepting this view, but it is now the only tenable one. A recharting of Larsen's discoveries on that coast in relation to Sir Hubert Wilkin's discoveries is needed. The result may not increase the probability of Morrell's landfall, but no other explanation seems possible. We cannot stamp Morrell as a sheer impostor when we examine his story, and we cannot wholly agree with Com. Gould that even if Enderby Land, *south* of which Morrell's charted track runs, is found to be continental, "his champions will, perforce, have to throw up the sponge." If we discard the accuracy of Morrell's observations in the Weddell Sea we have no right to accept them literally farther east. One matter that has been overlooked is the original discovery of New South Greenland. Morrell attributes it to Robert Johnson, who had sailed previously with him and also with Fanning. Johnson seems to have left no record. R. N. R. B.

THE MONTHLY RECORD

NEW OFFICIAL TITLE AND DIVISIONS OF YUGOSLAVIA

We welcome the information from the Royal Yugoslav Legation that the Kingdom of the Serbs, Croats and Slovenes is henceforth to be known officially by the much more manageable title of the Kingdom of Yugoslavia (*Kraljevina Jugoslavija*). Not quite so welcome, to cartographers at any rate, will be the news that the post-war administrative division of the country into 33 districts (*oblasti*) has now been abandoned in favour of an arrangement in 9 banates (*banovine*) and the urban district of Belgrade (*Beograd*), which includes Zemun and Pančevo. These banates, which with one exception are named after rivers, are as follows, the capital town being added in brackets: 1 Drava (Ljubljana), 2 Sava (Zagreb), 3 Vrbas (Banjaluka), 4 Primorje, *i.e.* Maritime (Split), 5 Drina (Sarajevo), 6 Dunav, *i.e.* Danube (Novi Sad), 7 Zeta (Cetinje), 8 Morava (Niš), 9 Vardar (Skoplje).

A rumour has reached us that the proposal to abolish the cyrillic alphabet, which is largely used in Serbia and Montenegro, has come up again and that there is now some likelihood of its being carried into effect.

COPENHAGEN AND BALTIC TRADE

The Royal Danish Geographical Society has recently published, as a supplement to the *Geografisk Tidsskrift*, a prize-winning essay on "The Commercial-Geographic importance of the situation of Copenhagen" by Mr. Johannes Reumert. The earlier chapters give a comprehensive sketch of the development of Baltic trade and navigation in general. They are largely concerned with the rise of the Hanse League and the supremacy of Lübeck. The blow to Lübeck's supremacy came with the advance in navigation which enabled traffic to pass through the Skagerak and the Sound, in place of the transhipment at Hamburg, and the overland, or canal, journey to Lübeck. The advantageous position of Copenhagen for controlling this new route is plain: for some time, however, trade merely passed the Danish shores, for Denmark had insufficient domestic industries to interest international commerce. The institution of Sound dues in the late fifteenth century was the first attempt to profit largely in this traffic. But at this time the prosperity of the Baltic towns in general was declining: the herring grounds of Scania were being abandoned for those of the North Atlantic, which could be worked directly by Dutch and English. But more powerful was the opening-up of the New World, which placed the countries of Western Europe, not at the western terminus of a Baltic–North Sea commercial system, but at the centre of a world-wide trade. Copenhagen, which became a town only *circa* 1170, developed slowly. Through the centuries her opportunity has come when the nations of Western Europe are engaged in war. During the Thirty Years' War great progress was made, and a luxury trade with the East was established. Again, towards the end of the eighteenth century Copenhagen was the chief transit port of the North, a position held until the destruction of her fleet by Nelson. Future development depends upon the extent to which this historic role can be maintained. At present Copenhagen handles a greater transit traffic than Sweden, with three large ports. The dangerous rival is Hamburg, supported by the Kiel Canal. The latter, however, has not proved as formidable a rival as was feared. The run for an 8-knot steamer from Flushing to Karlskrona by the Canal is three days, while by the Skagerak it is twenty-two hours longer, the actual saving, after allowing for canal dues, being calculated at 170 kroner. The difference is less however with faster steamers, which are compelled to spend the same time in the canal. Flushing is also a most unfavourable point to select for comparison. From Hull, for example, the difference is said to be neutralized, and for all points

in the Atlantic north of the line Liverpool–Porto Rico, the advantage is with the Skagerak route. Geographically, therefore, Copenhagen is not at a disadvantage; but general economic conditions give Hamburg a powerful position. Apart from its great economic hinterland, Hamburg is able to offer return cargoes: thus, while it would be cheaper to ship direct to Copenhagen, the prospect of a return cargo attracts much of the Baltic import trade to Hamburg, for transhipment to smaller vessels. This can only be met by the development of industries in Denmark, and the establishment of regular services with the other Baltic ports. The character of Copenhagen's trade is shown by the following figures: 58 per cent. of the import traffic is from the North Sea countries and 17 per cent. from the Baltic countries; while of the exports 31 per cent. goes to the North Sea, and 42 per cent. to the Baltic. Among the ports of North Germany and the Baltic, Copenhagen stands second, with Stettin, to Hamburg for total volume of trade.

GEOLOGY AND MINERALS OF GREECE

We have received from Dr. D. A. Wray the reprint of an article entitled "Greece: its geology and mineral resources," which appeared in the *Mining Magazine*, January–March 1929. It is a convenient summary based on the data gradually accumulated, mainly through the work of Austrian, German, and French geologists. The complexity of its contour and relief is conditioned by the complicated structure of Greece. The folded area to the west—itself composed of two parallel belts—differs entirely from the more eastern parts, which in turn may be divided into five structural areas: the crystalline massif of Thrace and Macedonia, the crystalline massif of the Cyclades, the folded zone of Central Greece, and those of the Southern and Eastern Aegean. The massif of the Cyclades has been profoundly modified by the Quaternary fractures which gave rise to the Aegean Sea. Central Greece consists mainly of sedimentary rocks of Cretaceous age somewhat disturbed by later fractures. In the southern folded zone Taygetus consists of a long jagged ridge of massive limestone, falling to more plateau-like country on either side; the highly folded strata trend north-north-west and terminate against the folded zone of Western Greece. The system is continued southward in the peninsulas of Maina and Malea, and reappears in Crete. In the Eastern Aegean (where the structure-lines run mainly north and south) a crystalline series is overlain by a thick succession of sedimentary rocks, those of Palaeozoic age being well developed. In all three areas the folding took place in early Tertiary times, though the different systems bear witness to different periods of activity. The folding in Western Greece was of later date, being intimately related to the main Alpine folding movements. These tangential stresses were succeeded in Quaternary times by a series of vertical movements and fractures, leading to the foundering of large areas, including the basin of the Aegean itself.

The more important minerals worked are magnesite, emery, and the ores of lead, zinc, chromium, iron, and manganese, but unsettled conditions have hindered extensive development. The fuel-resources are small, the Greek coals being low-grade lignites, and English coal is imported. The principal lignite mines are in Central Euboea and Western Attica. Greece is fairly rich in iron ores, but the absence of fuel for smelting causes them to be sent abroad, the amount varying very considerably from year to year. Iron pyrites is mined in Khalkidike, and manganese in the islands of Melos and Andros, but the output of the latter has greatly fallen off of late. Lead and zinc ores are found in various districts, the deposits of Laurion in Southern Attica being the most important. They were probably first worked by the Phoenicians. Several of the islands of the Aegean have lead and zinc mines, but most are now in disuse. Magnesite, one of the most important minerals exported, comes almost wholly from Euboea.

THE MAPPING OF FINLAND

A useful sketch of the history and present position of survey and mapping in Finland is contributed by Mr. K. Haataja to *Maanmittaus*, the Journal of the Survey Science Society established a couple of years ago at Helsinki (vol. 3, Part 4, 1929). It is written in German and is illustrated by specimens of the various official maps now being issued, and by index-maps showing the progress of triangulation and the present position in regard to publication. In the Swedish period, the first systematic surveys were begun in 1633, and a general map on the scale of 1 : 540,000, besides larger maps of certain areas, had been published before Russia took over the country. After this the Survey Office was transferred from Stockholm first to Turku (Åbo), afterwards to Helsinki. Special attention was given at first to maps of roads, ports, etc., but in 1843 systematic surveys of hitherto unmapped parts were inaugurated, and little by little commune-maps on the scale of 1/20,000 were available for most of the country. From 1866 on, the general map of the whole country on the scale of 1/400,000 was taken in hand, its basis being supplied by a triangulation, the fixed points of which were linked to the Russian–Scandinavian degree-measurement at Olostunturi and Kuivaskero. In the south, astronomical determinations were also made, and in all 66 fixed points were determined—an average of 3·3 for each of the 20 sheets, which were ready for issue in 1873. In 1890 a complete revision was begun, and by 1927 the whole had been re-engraved. Recently the maps have been drawn on double scale and reduced by photo-lithography. The commune-maps have also been revised by new methods, and, by 1928, 28 per cent. of the total number of communes had been provided with such maps, covering 17 per cent. of the whole area of the country. An economic map, showing communications, settlements, cultivation, forests, etc., is being brought out on the scale of 1/100,000, in sheets each covering 15 minutes of latitude and 30 of longitude; and there are various special maps besides. Much of the material used has been got together for cadastral and other economic purposes, but it is reckoned that, given a suitable geodetic basis, about 15 million hectares out of a total of 33 million are covered by trustworthy surveys. In the past the triangulation depended largely on old work such as that of Schubert and the international degree-measurement, and the fixed points had to be supplemented by astronomical determinations; but a new basis has been supplied by the more precise work of recent years, especially the triangulation of the first order undertaken by the Finnish Geodetic Institute inaugurated in 1918.

LOP NOR PROBLEM

Dr. Emil Trinkler, the Central Asian traveller, summarizes in the *Zeitschrift* of the Berlin Geographical Society (Ht. 9/10, 1929) what is known of the Lop Nor basin, Eastern Chinese Turkistan, from the work of previous travellers, supplemented by his own observations. The greater part of this basin, now an extension of Taklamakan eastwards across the Tarim, was covered by a great fresh-water Post-Tertiary lake, the limits of which, marked by steeply eroded terraces, may easily be traced, despite the great changes through wind erosion. It is impossible at present to correlate these terrace levels, but Dr. Trinkler believes that all this region below 900 metres was covered by the prehistoric lake. On the north and south it washed the base of the Quruq Tagh and Altin Tagh ranges: its limit on the west is more difficult to determine through the advance of sand-dunes, but it apparently extended to the Tarim River. Sir Aurel Stein holds that this depression had an exit in the east to the Suluho. At its lowest level Dr. Trinkler believes this lake covered the Loulan site excavated by Sir Aurel Stein, and there is evidence elsewhere that the ancient Chinese routes crossed the basin of this

lake. The lake of the Chinese annals was salt, whereas the older was a fresh-water lake. At Loulan, also, there is evidence of its progressive shrinkage. The limits of the historic lake can be roughly determined from the evidence supplied by the Chinese trade routes, which skirted it on the north and south. Dr. Trinkler, however, is more concerned to discover the history of the hydrographical system, and the precise area to which the term Lop Nor has been applied. At present the Tarim and the Konche Darya end in the swamps of Karaburan and Karakoshun, north-east of Charkhliq. The dry course of a large river, the Quruq Darya, is to be traced along the northern edge of the basin, at the foot of the Quruq Tagh, to its end in the remains of a well-developed delta near Loulan. Stein has shown that formerly the Quruq Darya must have been the lower course of the Konche Darya, and that only with this volume of water could the extensive civilization revealed around Loulan have been maintained. (This is again the case: see Col. Schomberg's note in the December *Journal*.) Some water found its way to the Tarim, which from the earliest historic times flowed southwards to unite with the Charchan river and finally to find its way to the Karakoshun marshes. Hedin considers that no water followed the present course of the lower Tarim, and that the Karaburan and Karakoshun marshes did not exist in early times, chiefly, it seems, because he found no signs of trees around them. Parallel and to the north of the Charchan there is an older bed: Trinkler explains the hydrographical relations by making this old course of the Charchan, after uniting with the diminished Tarim, run eastwards to a bay of the former lake which has been located south of Loulan. When Prjevalski reached the Karakoshun marsh in 1876–7, he claimed it as the Lop Nor of the Chinese maps, but this claim was contested because of its southerly position. Trinkler believes that the dwindling lake into which he supposes the Charchan to have flowed is the Lop Nor of the Chinese maps. He thus establishes four stages from the prehistoric lake to the present Karakoshun marshes. As Col. Schomberg reports that these are now drying up, a fifth stage is developing with the renewed flow of the Quruq Darya.

CLIMATIC CHANGE IN NORTH AFRICA

In *Antiquity* (December 1929), Mr. E. W. Bovill gives a succinct summary of the arguments against the desiccation of North Africa during historical times. The great scale of the Roman ruins at Timgad and El Djem, the historical role of North Africa as the "Granary of Rome," and the evidence of a fauna now confined to tropical Africa, have led to the belief that the country formerly enjoyed a much heavier rainfall. As M. Gsel has shown, however, the change, if any, has been slight. Springs and wells have been neglected by the natives, and aqueducts and reservoirs destroyed by invaders. The rivers have apparently the same approximate volume, from the evidence of bridges and fords. The grain tribute to Rome was not a great strain upon the total resources of the region, the prosperity of which then depended upon the innumerable olive groves. Further, the disappearance of the tropical fauna, particularly of the elephant, is to be attributed to man. The Carthaginian use of the elephant is well known; the demands of the Roman circus for wild beasts led ultimately to their extermination.

To the south of the Sahara, conditions are slightly different. In recent years there has undoubtedly been a progressive advance of desert upon the Sudan. In Senegal, within the bend of the Niger, and in Bornu and Sokoto, there is a distinct southward drift of population, primarily, but not entirely, due to the failure of water supplies. This trouble has largely been increased by the ravages of the "shifting cultivator." The natural growth of the population is also taxing the resources severely. It has been argued, from the "fossil" sand-dunes existing in this part of the Sudan, that in historical times this encroachment has been in a

reverse direction, *i.e.* that the area of the Sahara has been decreasing. Mr. Bovill, however, concludes that, apart from the effects of a temporary, and minor, drier climatic cycle at present, the area of the Sahara has not appreciably altered in the last fifteen hundred years. The reports of the disappearance of oases within the Sahara itself, and the dwindling of their populations, he attributes to human action. The threat of the nomads to the settlers has led the latter to confine themselves to the minimum area necessary to support life, and to allow oases to go out of cultivation. The check to the slave trade—most of the cultivation was done by negroes—the decay of trade through the opening up of alternative routes, and political unrest have also been contributory. At present the more tranquil conditions are already resulting in the development of cultivation. The contrast between classical and modern Northern Africa is therefore the work of man, and not of climatic changes.

AIR SURVEY IN S.E. ALASKA

A recent experiment in rapid survey from the air, made by an expedition in S.E. Alaska in 1926, is described by Messrs. R. H. Sargent and F. H. Moffit in Bulletin 797—E (Washington 1929) of the United States Geological Survey. Although that Survey has been at work on topographic mapping in Alaska for thirty years, less than half the area has been covered, and it was felt that the new method would be particularly applicable to a country remote and in parts almost inaccessible. The Survey sought co-operation from the Navy Department, which in due course organized the Alaskan Aerial Survey Expedition under the leadership of Lieut. B. H. Wyatt of the Bureau of Aeronautics, with Lieut. W. M. Dillon as executive officer. The tender *Gannet*, with Lieut. W. R. Spear in command, was detailed for the work, and additional room for the photographic operations was furnished by a barge 140 feet long and 40 feet wide, roofed over and manned as a separate unit. Mr. Sargent accompanied the expedition in an advisory capacity as representative of the Geological Survey. The ground chosen was in the south-east of Alaska, whose numerous waterways make it easily accessible to vessels, thus saving expense, while as it includes the most valuable forests, with extensive mining and fishing interests, and a considerable proportion of the population, it was a region for which better maps were very desirable. In the absence of landing-fields for aeroplanes, amphibian planes were taken, of a type capable of being easily drawn out of the water and operated on land in case of need. Of the four originally supplied, one was wrecked en route, and the work was actually done by three. The cameras for map work were tri-lens, taking three pictures simultaneously—the central one in a horizontal plane, the other two oblique—this permitting a wider field to be covered at one flight. The flights, spaced at 3½ miles to allow a proper overlap, were mostly made transversely to the axes of the islands surveyed, which included all the larger units and together made up some 10,000 square miles, the total number of negatives being approximately 17,280. As the region is one of heavy precipitation, and is liable to fog at certain seasons, it was necessary to take advantage of all favourable weather, but it was found that when the clouds were high and not too dense the illumination was sufficient and uniform enough to permit work, while scattered clouds, through the heavy shadows cast, were often a more serious obstacle. An arrangement has been made for the sale of the prints to the public at cost price.

DR. TROLL'S EXPLORATIONS IN THE ANDES

Dr. K. Troll, whose scientific researches in the Bolivian Andes were referred to in the *Journal* for September 1927 (vol. 70, p. 316), carried out further journeys in 1927–28, a preliminary account of which has appeared in *Petermanns Mitteilungen*, 1929, Heft 7/8. This time he paid especial attention to the eastern section

of the Andes, descending twice to the lowland at their foot and reascending by different routes, so that he obtained four cross-sections of this part of the range. Where possible he deviated from the usual tracks, and the result is to alter existing maps in many particulars, while besides his geological studies he collected several thousand specimens of plants and was able to construct a detailed vegetation-map of the whole region. The section of the Andes lying between 14° and 30° S. and known to geologists as the "Puna" block, is that in which the range takes on its most massive character. In the south-east, with which Dr. Troll was mainly concerned, it is marked by a system of meridional ridges separated by wide depressions, while to the east a series of forest-clad marginal ridges forms the passage to the lowlands, and one of the traveller's main objects was the definition of the natural boundary between these and the Puna proper. Like Mr. Schmieder, who in 1926 gave his observations on this region in the Publications of the California University, he found the Puna to drop steeply to the eastern marginal zone by a very definite line. In accordance with its structure the Puna may be divided into three main zones, running from north to south. The western is a high upland with a general altitude of 4000 metres and only sinking to 3000 on the head-streams of the Pilcomayo and Rio Grande. Its basis is Palaeozoic schists with infolded strata of Cretaceous-Tertiary age, while traces of Tertiary volcanic action are much in evidence. The central zone is a meridional furrow, to be traced for long distances to north and south, and named by Dr. Troll the Chichas-Chuquisaca depression. It is largely composed of deposits from an ancient ice-age. The eastern zone is a moderately elevated tract with peaks rising to 5000 metres, but with a general altitude of 2500 to 3500 metres. Volcanism is absent, the whole consisting of Palaeozoic schists and sandstones with but small inclusions of the Cretaceous and Tertiary "Puca" formation, which constitutes the bulk of the marginal ridges beyond. The ranges of the eastern section are marked by anticlinal folding, running either from north-west to south-east, or from north to south, these being also the dominant structure-lines in the whole Central Andes. Dr. Troll found evidence of a uniform inter-glacial upward movement of this part of the range, the steep drop to the east having a similar character both north and south of the angle in which the two directions meet in the neighbourhood of Santa Cruz. The paper deals at some length with the vegetation formations and ends with notes on the "Yungas," the remarkably fertile belt occupying a furrow at the north-eastern foot of the Cordillera Real in the latitude of La Paz, and noted from of old for the cultivation of koka. It runs transversely across the river-courses and seems to owe its origin to the more friable nature of the rocks. It appears to have never been generally forest clad like neighbouring regions.

OBITUARY

PROFESSOR NAOMASA YAMASAKI

We much regret to learn that Dr. Naomasa Yamasaki, Professor of Geography in the Tokyo Imperial University, and a Vice-President of the International Geographical Union, died on 26 July 1929, at the age of sixty. He was a native of the famous province of Tosa, in the island of Shikoku, and received his early education in the "Third Higher School" of his native city, from which in due course he passed to the Imperial University of Tokyo. He at once made his mark as a student of geology of unusual promise, devoting his attention to a systematic investigation of some of the greater volcanoes of the main island as well as of the

famous Miharayama on the island of Oshima, off the coast of Sagami, his writings on which attracted attention.

Some thirty years ago he was sent to Europe as the first travelling student in geography, spending a considerable time in Vienna under the guidance of Professor Penck, and publishing papers in *Petermanns Mitteilungen*, etc., on such important subjects as "The Geography of Taiwan (Formosa)," and "The morphology of Seto-naikai (The Inland Sea)."

On his return to Japan he devoted his special attention to the question of the glaciology of the Japanese Alps, and the cirques and other glacial phenomena of that region were first scientifically observed and described by him, as was the "fault" system of the Tai-hang-shan mountains in North-Eastern China.

Perhaps his most important work, with which his name will always be connected in his own country, was the establishment of the School of Geography in the faculty of Science in the Imperial University of Tokyo, in which he lectured with great enthusiasm on his favourite subject in all its aspects, during the last decade of his busy life.

His most recent publication dealt with the coastal topography of Japan, and the chronic and acute tilting movement of the Earth's crust in Japan. A résumé of the latter investigations was read by him as his contribution to the programme of the International Geographical Congress at Cambridge in 1928, of which he was a Vice-President.

Professor Yamasaki was a sincere admirer of England, which he visited on several occasions and where he was much liked by all who knew him as a man not only of outstanding ability and great modesty, but also of great personal charm. On his way back to Japan, after the Congress, he spent some weeks in the United States, where he was in constant requisition as a lecturer and speaker. His unselfish and kindly nature, however, led him to undertake far more engagements and lengthy journeys than his strength could really stand, and there is little doubt that it was this devotion to his chosen cause that led to the payment of the ultimate penalty. W. W.

WILLIAM CECIL SLINGSBY

The name of William Cecil Slingsby, who recently passed away in his eighty-first year, has been well known in climbing circles for more than fifty years. His many expeditions in the Alps with his cousins the Hopkinsons, with Mummery, Collie and Hastings, inaugurated a new era of guideless climbing which placed him in the front rank of mountaineers. But it is in Norway that the name of Slingsby is held in most affectionate and enduring remembrance. He is the father of mountaineering in that country, and as such he is honoured as no other Englishman has ever been. At his death he possessed an enormous circle of Norwegian friends from whom in the long course of years he had acquired a unique knowledge of the people, legends, and sagas of the country. He was the most democratic of men in his personaal intercourse, and he had an old-time courtesy and a joyous sympathy with people of every race and class that endeared him at once to the humble people with whom he delighted to associate on his travels. His first solitary ascent of Store Skagastölstind in 1876 brought him instant and enduring fame in Norway, for it was then thought to be the highest as well as the most difficult mountain in Northern Europe. It was, however, only the first of a long series of journeys which Slingsby continued to make for many years in his exploration of the glaciers and snow passes of Central Norway.

In the Jotenheim, which he discovered and explored, his name is on every wanderer's lips to-day as it was forty years ago, and his exploits, even during his

lifetime, were celebrated as if they were those of some ancient hero of a romantic saga. This is quite as it should be, for as an explorer of mountains he stood entirely alone. Only those who have followed his footsteps are likely to understand what his adventures involved. The valleys through which he forced his way from one unclimbed mountain to another lie very near the Arctic circle, and are often 4000 feet above the sea. They were inaccurately mapped. The rivers to be crossed were numerous, unbridged, and very swift. Glaciers were often deeply crevassed and the mountains rugged and steep. Even in summer, Arctic blizzards of sleet and snow sweep down on the traveller, when he is many hours from the nearest shelter. In the '70's there were no comfortable mountain inns in which to sleep, and it often involved hardihood of the first order to go from one place of shelter to the next. It also involved unerring judgment and first-class mountaineering craft.

In his early years Slingsby travelled with the Englishmen Mr. Sidgwick and Mr. Dewhirst of Skipton, but many of his most adventurous journeys were made with Norwegians, of whom Prof. Emanuel Mohn and the Torgier Sulheim were his best-known companions. Their difference in standing is enough to show how wide was his circle of acquaintance. He was the only man ever elected to an honorary membership of the Norwegian Tourist Club, and on his last visit to Norway his welcome partook more of the nature of a royal reception than that of a private function, when he went out to unveil a memorial to the 4000 Norwegian fishermen who lost their lives in the Great War. HOWARD PRIESTMAN.

CORRESPONDENCE

THE DEATH OF MUNGO PARK

I have read with interest in the *Geographical Journal* of November 1929 the note on the Park-Lander Memorial, and wish to comment on the following extract: "The island is only some 80 miles below Bussa, where Mungo Park's traverse down the river was terminated by his death by drowning in the course of a combat with natives who tried to obstruct his passage."

In July 1901 I was quartered on Jebba Island with the 1st Battn. Northern Nigeria Regiment. At that time there were living at Jebba two aged natives who gave a vivid account of Park's end, as related to them by their respective fathers, who had been actual witnesses of it. Those two old men were most indignant at the belief current among the Europeans that Park's end had been due to the hostility of the natives. Their account of the affair was like this: News got about that a white man in a canoe was coming down the river towards Bussa; the natives knew that he was a stranger who was probably unaware of the existence of the rapids and of the consequent danger awaiting him thereat; they therefore turned out (some of them mounted) and made their way up the river-bank until they met the canoe; they signalled to him to halt, but he, mistaking their friendly signals for hostile ones, pushed on and met his death by drowning in the rapids. This tale sounded true; for remember the facts: We know that Park had never passed up the river; had he so done, the natives were bound to have known; it was therefore evident that the white man was necessarily a stranger who was in great danger, and they proceeded to warn him of his danger. A stranger going downstream in a dug-out canoe and ignorant of the peril he was approaching, as Park

was, was going to practically certain death. Had the natives been hostile, they would have passively awaited his end in the rapids.

M. CAMERON BLAIR,
West African Medical Staff: Retired.
(Formerly of Northern Nigeria.)

Note by Ed. G.J.—There is some difficulty in reconciling this account with that given by Mr. W. Hamilton-Browne, Resident of Kontagora, in a despatch to the Secretary, Northern Provinces, communicated to the Secretary of State for the Colonies by the Governor of Nigeria (*G.J.*, 57, 130, February 1921). The story as it was told at Bussa, extracted from a report by Mr. J. C. O. Clarke dated 24 March 1913, was that a white man came down the Niger in a canoe, stayed several days at Bussa, started down the river, and was capsized in the rapids. His stay at Bussa is attested by the fact that a silver medal of George III, now mounted in a ring, was given by the white man to Kisaran Dogo, and is still prized among the insignia of the Emirs of Bussa. Some part of the difficulty is removed if we read in Mr. Blair's account: "coming down the river *from* Bussa." There is in the collection of the Society a photograph of the Bussa Emir wearing the medal as a ring, presented in 1921 by Mr. H. S. W. Edwardes, who had recently descended the Malali rapids where Park was drowned. In an accompanying letter Mr. Edwardes wrote that above the rapids the river divides into three. To a stranger coming down the river the middle channel appears the obvious course, but the only possible canoe passage requires a sharp turn to the right, and then to the left. The natives shouting and gesticulating on the mainland were probably trying to guide him to this channel.

MEETINGS: SESSION 1929-1930

Third Evening Meeting, 2 December 1929. The President in the Chair

Elections: Leopold John Touchett Ainsworth; Edgar Rogers Brown; Capt. Richard Crofton; H. M. Dibert; Pandit Uma Shanker Dikshit, B.A.; Anthony Fiala; Harold Fyson; The Rev. F. F. Greig; Behari Lal Gulatee; E. W. Gunapala; The Rev. Robert Halton; Charles Yeo Harper; Percy Harrison; Major Oliver Frederick Gillilan Hogg, R.A.; Miss Amtub Rashid Niaz Husain; Major the Hon. J. Barry Jackson; His Highness Prince Yusuf Kamal; William Lees; Capt. Thomas Hamilton Lindesay, R.E.; Roy Henderson North; Prof. Michael Thomas Morley Ormsby; The Rev. George Henry Raley; Touqir Mirza Risci, M.A., LL.B.; John Leslie Roberts; Joseph Seward Ruston; A. H. Saastamoinen; Richard Cox Scott; Vahe Joseph Sevian; Miss Margaret Wedd

Paper: The Central African Highway. By Mr. Owen Tweedy

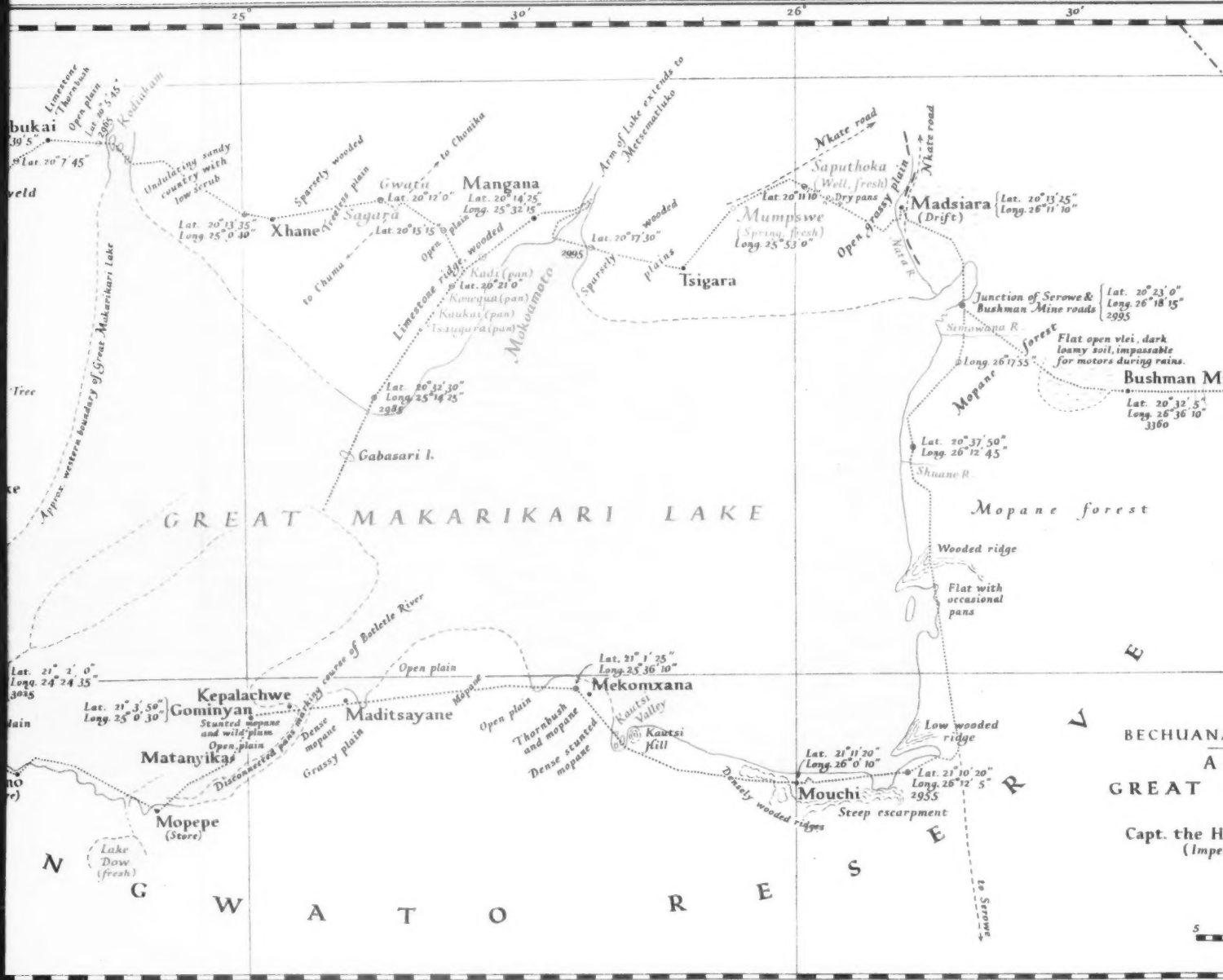
Fourth Evening Meeting, 16 December 1929. The President in the Chair

Elections: Maj.-Gen Harold Bamfield, C.B., D.S.O.; Timothy Cyril Pitt Brook, B.A.; R. Ogilvie Buchanan, M.A., B.SC.; Peter C. Christian; The Ven. Archdeacon Archibald Lang Fleming; Capt. Andreas Johannes Floor; John Fraser; Miss Alberta Wake Gearing; Charles Henry Grove; Reginald Reuben May; Miss Faith Moore; Henry Rawlins Cope Morgan; M. Nazir, B.A.; Guy Walter Otter, B.A.; Mrs. E. M. Pemberton-Hodgson; James Steele; Paul E. Vernon; Thomas Saville Whittle; Dr. Hugh M. Woodman

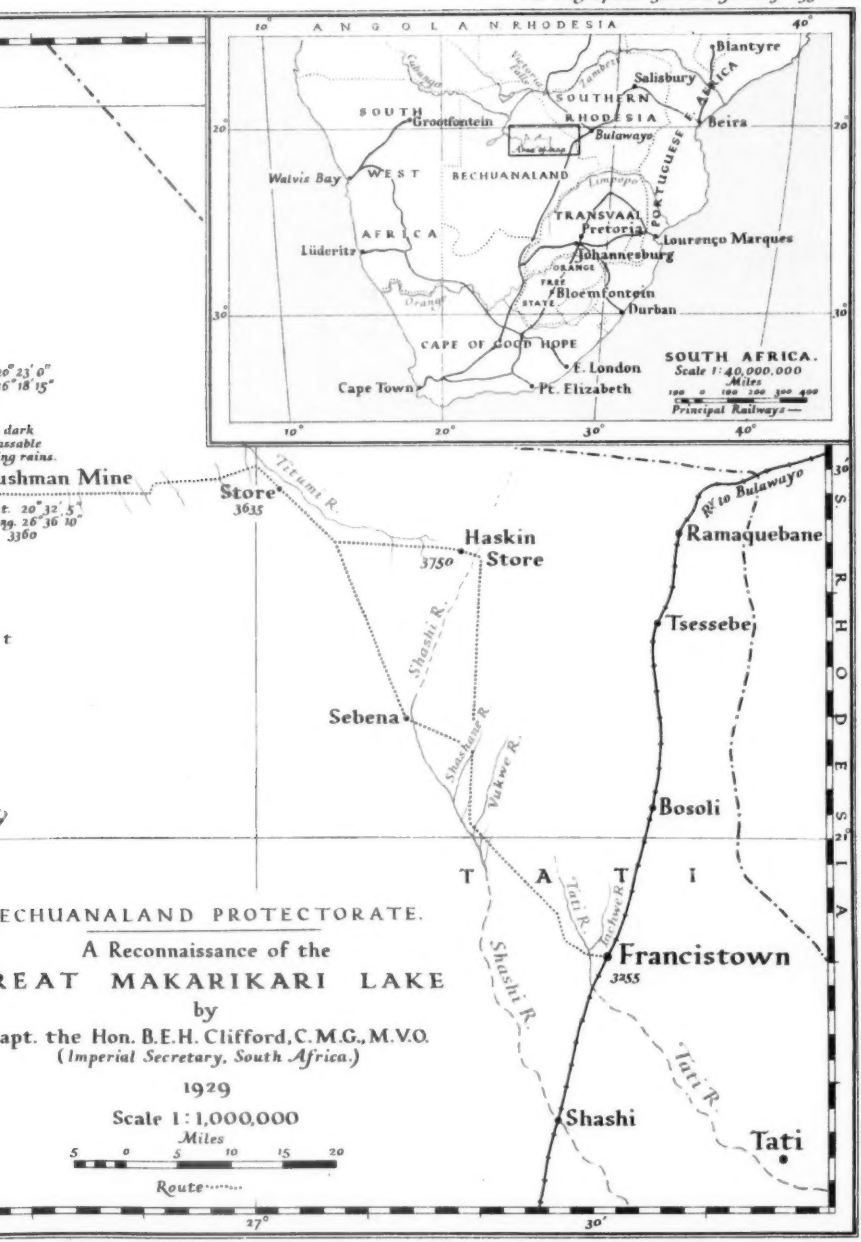
Paper: Further Work on the Great Barrier Reefs. By Mr. M. A. Spender

24°
30°
BECHUANALAND PROTECTORATE
20°
21°
Limestone Thornbush
Open plain
Lat. 20° 5' 45"
Long. 24° 39' 5"
Tubukai
Lat. 20° 7' 45"
Kalahari sandveld with low scrub
Botletle River
Makalamabedi
Lat. 20° 19' 10"
Namissan
(Drift)
Lat. 20° 24' 0"
Long. 24° 22' 50"
2970
Dense thornbush
Long. 24° 27' 0"
Lat. 20° 30' 10"
Letter Tree
Kalahari sandveld with low scrub
Thornbush
Botletle River
Gasebake
Phukumakahu
Approx. western boundary of Great Makarikari Lake
Dense Botletle River
Long. 24° 21' 50"
Sesume
Jacops
Rakops
Police Camp
Lat. 21° 2' 0"
Long. 24° 24' 35"
3025
Flat treeless plain
Lat. 21° 3' 50"
Long. 25° 0' 30"
Gomo
(Store)
Lake Dow
(fresh)
Note
This map has been reduced from Capt. Clifford's compass traverse, adjusted by him to his astronomical positions determined with a theodolite and chronometer rated by wireless time signals. These positions are given in figures on the map. Heights, in feet, are from aneroid readings.

Published by the Royal Geographical Society



Published by the Royal Geographical Society



GREAT MAKARIKARI LAKE.
Clifford

UNIV. OF MICH.